American Machinist

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New Tools—Part of G.E.'s $1,000,000 expenditure for its Pittsfield plastic plant went for new toolroom equipment.

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MAJOR ARTICLES

"They'd None of 'Em Be Missed" 1250
Plastics at Pittsfield 1252
A Place for Everything 1254
Air Gages for Checking Accuracy ..... *Chester H. Franklin* 1256
Electric-Furnace Brazing—II ..... *H. M. Webber* 1259
Wage and Hour Legislation ..... *William J. Kelly* 1263
Machine Tools at the Paris Fair ..... *Alfred Wasbauer* 1266
Deep Tapered Shells ..... *Mark Golden* 1270

SHORT ARTICLES

Dangers of Federal Control 1262
Recruits for Jap Munition Plants 1272
What Should a Modern 30-in. Lathe Be? 1297
Engineering for Production in Stainless Steel 1298
Spot Welding of Copper-Base Alloy 1301

IDEAS FROM PRACTICAL MEN

Indexing Drill Jig ..... *William D. Greener* 1275
Grinding Slender Work ..... *Charles Weslow* 1275
Pneumatic Tire Remover for Railway Shops ..... *Frank C. Hudson* 1276
Dog for the Grinder ..... *J. R. Whittles* 1276
Blade and Toolbit Holder ..... *Gaylord G. Thompson* 1276
Holding Counterbores and Tangless Drills ..... *R. G. Hewitt* 1277
Holder for Welding Rods ..... *John E. Hyler* 1277
Counterbalancing an Arbor Press Ram ..... *Paul C. Bruhl* 1277
Trepanning Tool for Connecting Rods ..... *Herbert Crawford* 1278
Drilling the Ends of Long Work ..... *K. English* 1278
Attaching an Indicator to the Surface Gage ..... *Theodore Kruger* 1278

DEPARTMENTS

Editorial 1249
Talking Shop 1265
Round Table 1273
Reference Book Sheet 1279
Chips 1280a
Industrial Review 1280a
Detroit Letter 1280b
News 1280d
Watching Washington 1280e
Shop Equipment News 1281

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. . . coming January 26

AMERICAN MACHINIST

AMERICAN MACHINIST

ESTABLISHED 1877

F. H. COLVIN • K. H. CONDIT • BURNHAM FINNEY, Editors

How Many Incidents?

HOW MANY "incidents" does it take to provoke a peaceful nation to war-like moves? The Japanese army and navy leaders seem to be determined to carry this interesting bit of psychological research to a definite conclusion. They have apparently forgotten that Germany carried on a similar investigation some twenty years ago and got a very unsatisfactory result.

Strangely enough the incidents only happen to nationals of the two great peace-loving democracies, Great Britain and the United States. The British ambassador to China was hit by machine gun bullets from the air, a little American river gunboat was sunk by aerial bombs and British boats were attacked at the same time. Can there be any connection between them and the expressed desire of both countries for peace?

In 1915 the same thing was going on, so far as the United States was concerned. It is unnecessary to relate the incidents that finally led to a break. What is important is the parallel between the underlying situations. Then President Wilson was sending sharp notes to the Central Powers, while his Secretary of State was telling their ambassadors that the notes were not to be taken seriously. The American people did not want war. But the temper of the people finally changed abruptly under repeated goading, and it was then too late for diplomacy.

Today President Roosevelt has acted promptly and properly in a complaint addressed to the highest authority in Japan. But almost simultaneously members of the House petitioned out the Ludlow amendment to the Neutrality Act, which is a pacifist attempt to prevent war but which would probably serve to hasten a declaration because of the obstacles it puts in the path of diplomacy. Isn't any authoritarian diplomat or statesman justified in assuming from this move that the President's notes can be ignored with impunity? And, if so, aren't the American people following the same dangerous course that ended in war in 1917?

IN 1917 the United States was pitifully unprepared to take an active part in any kind of war, defensive or otherwise. Today the situation is not quite so bad thanks to the quiet planning that has been going on under the direction of the Assistant Secretary of War. But there is nothing in America to correspond to Great Britain's defense program. If there were it is quite likely that fewer incidents would occur. One excellent way to convince the Fascist countries that too many incidents might be dangerous would be to pass promptly the bill authorizing the placing of educational munition orders with which AMERICAN MACHINIST readers are quite familiar.

"They'd None of 'Em Be Missed"

Federal bureaus, commissions and boards have multiplied like mushrooms in the exhilarating atmosphere of the New Deal. Which ones can we spare?

Gilbert and Sullivan fans will recognize the above title as a line from Koko's famous song in "The Mikado"—"I've got a little list." When President Roosevelt issued a general challenge to the country some weeks ago asking what government bureaus or activities could be abolished or consolidated in the interest of economy it occurred to us that we might ask our readers to make a little list for him. Here are some of the suggestions.

The country would breathe more easily if—

The following occur to me as some governmental agencies, which definitely overlap and which could be abolished and their duties transferred or which could be combined with one or more agencies:

Federal Surplus Commodities Corporation,
Commodity Credit Corporation,
Emergency Conservation Works,
Electric Home and Farm Authority,
Rural Electrification Administration,
Federal Coordination for Industrial Cooperation,
National Resources Commission,
National Youth Administration (said to be Communistic),
Resettlement Administration,
U. S. Railroad Administration.

More controversial, of course, are the following bureaus but it seems to many of us, if they were abolished, or their duties transferred, the country would breathe more freely:

Federal Housing Administration,
Home Loan Administration,
Home Owners Loan Corporation,
Tennessee Valley Authority,
National Labor Relations Board (Transfer to Federal Trade Commission),
Bituminous Coal Board (Transfer to Federal Trade Commission)
Federal Emergency Relief Administration,
Public Works Administration,
Works Progress Administration.

The last two should be curtailed definitely in activities and their activities should be combined.

The Social Security Act should be entirely rewritten so as to be placed on an economic basis.

J. C. ARGETSINGER
Vice-President
Youngstown Sheet and Tube Co.

It is risky to criticise without facts—

Of course I will accept the challenge of the President of the United States, but the President is a much more clever politician than I. How can we tell Mr. Roosevelt what governmental functions can or should be eliminated, unless we know and understand all of the governmental functions? How can we "be fair" unless we thoroughly study governmental functions and become authorities to say what should exist and what should not exist? I think I would have to join the ranks of the chorus who sang the refrain in "The Mikado," thus: "They'd *none* of them be missed."

You will print these opinions in *American Machinist* but they will be over the names of individuals who may or may not be qualified to express such opinions. I know that good speakers usually select a subject of which they know very little to form the basis of an address. But it seems to me in this instance that it is a little risky to criticise or offer advice without facts and a full knowledge upon which to base the advice. It occurs to me that during the last campaign for the presidency I heard a lot over the radio about a thorough study of the governmental departments and a promise to reduce governmental departmental expenditures 25 per cent. At the time this statement was made by our President he must have had something in mind. What is he passing the buck for now? Why doesn't he go ahead with the program he had in mind? HOWARD W. DUNBAR
Vice-President, Norton Company
President, National Machine Tool Builders' Association

You can't be successful forever if you spend more than you take in—

I am not a deep student of politics and know much less about the question you ask than many others in a similar line of business. I only know one thing. You can't be successful forever if you spend more than you take in, and I think the take-in is about as high in this country as it should be at the present time.

If I were Mr. Roosevelt, however, and had the say about taxes I would do away with the Income Tax and Undistributed Profits Tax, and institute a Sales Tax, which to my mind is the only fair way of raising revenue. This puts the cost of government on everybody.

Another thing I would like to see fixed up is the Labor Relations

Board. I think as this board is constituted now it is a disgrace to this country. I think it is absolutely impossible for a manufacturer to get a fair deal before it.

I have also been thinking of the United States Department of Commerce. I believe the cost of running that department, which is tremendous, could be cut in two with no ill effects to the citizens of the United States. W. B. McSKIMMON
President
Union Twist Drill Co.

Washington would have more empty office space—

As far as any value to our company is concerned, if most of the new government functions that have been set up in Washington in the past five years, together with many of the others in operation prior to the last five years, were completely abandoned, and those remaining reorganized on a strictly essential and non-overlapping basis, we would never miss any one of them. We are quite sure that Washington would have more empty office space than any other city in the world and the taxes we are now paying for these useless government functions would be very materially reduced.

Now we have tried honestly at various times during the past many years to avail ourselves of these government functions for which we were paying, to see whether or not they could be of any real service to us. Naturally the one that we thought could always be of most help was the Bureau of Foreign and Domestic Commerce. The statistics they compile for our industry are totally unreliable. When we check against their reported exports of machines with our own group figures which we secure from our association office it is apparent that something is radically wrong. Our own figures are reliable but those compiled by the Department of Commerce are not reliable.

W. E. WHIPP
President, Monarch Machine Tool
Vice-President, National Machine Tool Builders Association

We can't solve the taxation problem by taxing business out of existence—

We must revise the Wagner Act so that both parties to collective bargaining—employers as well as employees—will get a square deal.

We must make a real effort to balance the national budget and wipe out the threat of ruinous inflation.

We need a drastic revision of our present methods of taxation. The Undistributed Profits Tax as now set up is directly contributing to unemployment. The tax penalizes the retention of earnings in a business for the purpose of installing new machinery and equipment. This means less business and less employment in machinery and equipment industries.

The Capital Gains Tax should be revised. As the tax stands today, it places a heavy penalty on prosperity.

The Social Security plan should be revised. As it stands today, it places an unduly heavy burden of taxation upon both employees and employers without guaranteeing the security which it is designed to provide.

But don't think we can get out of heavy taxation. Some way, somehow, we have got to pay for the spending spree in which we have been engaged for the past five years. But I do say that we are not going to be able to pay enough taxes to foot this bill unless we are allowed to go ahead and do some business. We can't solve the taxation problem of this country by taxing business out of existence. T. M. GIRDLER
Chairman of the Board
Republic Steel Corporation

Curtail expenditures 25 per cent in every department—

Replying to your recent communication, seeking the writer's opinion as to how expenses of government could be reduced, I have given this matter considerable thought. I have reviewed certain government reports as to expenses, and feel free to state that it is generally impossible for a layman to make concrete suggestions as to particular appropriations.

I am of the opinion that this remark of the President was thoroughly in harmony with much that he does and says. He knows full well that the minute a listing might be made of several departments, he would take such suggestions and show how they would be infeasible.

My suggestion would be along another line. Everyone well knows, and this includes the President also, that practically all of the government departments have been honeycombed with opportunities for economy if those in charge were seriously concerned with economy. The President himself has generally given lip service to economy, after beginning his administration with a seemingly conscientious effort to achieve economy. For political and other reasons that endeavor of his has been generally given up, and his administration with its lavishness in the display of public funds has impressed everyone in this country with the gross extravagance of government in general.

If the President and his advisers will do so, they are able and are well informed where economies can be made. It is up to Congressmen to stand back of the conscientious and well meant efforts of the administration itself. My suggestion practically then is to this effect, that expenditures of the various departments should be studied by the administration with the idea of seriously curtailing public appropriations to the extent of 25 per cent in every department. Doubtless this could not be accomplished the first year, but a goal once placed could be arrived at through a series of years.

HENRY D. SHARPE, *President*
Brown & Sharpe Manufacturing Co.

If the suggestions made to Senator Byrd's committee by the Brookings Institution—

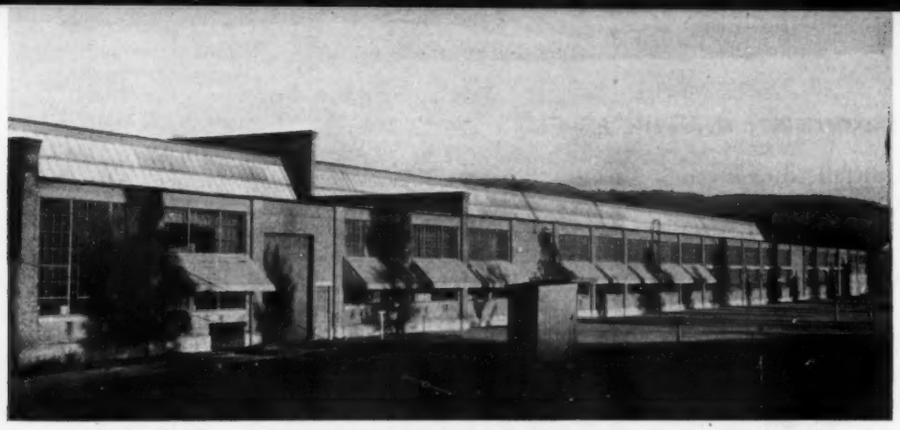
The confusion and extravagance of the federal government is due in part to the fact that it has never been reorganized by a competent agency. It is the biggest and most complicated business in the world, and certainly no great amount of progress will be made toward effective reorganization as the result of opinions expressed by business men, who at best can only see small sectors of its many ramifications.

I can only suggest that a good start would be made toward more effective organization and economy if the suggestions made to Senator Byrd's committee by the Brookings Institution were given careful consideration and put into effect as far as might be possible in view of unavoidable political considerations.

LOUIS RUTHENBERG
President, Servel, Inc.

Senator Byrd's Minority Report should be accepted—

Personally, I know of no better way to meet your request than to state that Senator Byrd's Minority Report on the Reorganization of Governmental Departments be accepted as the program. He is such an excellent authority on the subject that I think we would do well to go along with him. JOHN F. TINSLEY
Vice-President, Crompton & Knowles Loom Works



Nesting in the beautiful Berkshire Hills, an idle building was transformed into a productive plant through the judicious admixture of sound engineering and a million dollar outlay

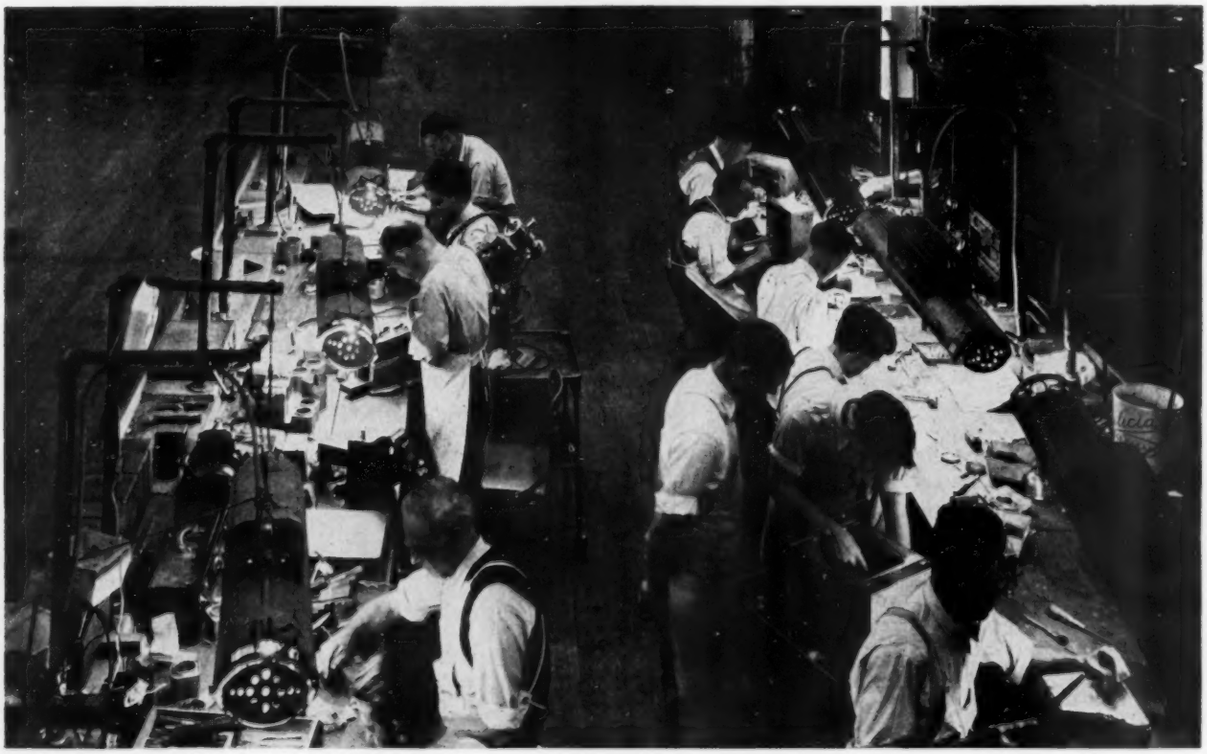
Plastics at Pittsfield

DURING 1937 the General Electric Company set up at Pittsfield, Mass., a new plant for the production of molded plastics. A building formerly used by the Ceramics Division was entirely renovated, and molding equipment moved from the Pittsfield transformer plant where it was formerly housed. New machine tools for the toolroom and 68 new presses were added to provide a modern manufacturing unit to meet the increasing popularity of plastic materials.

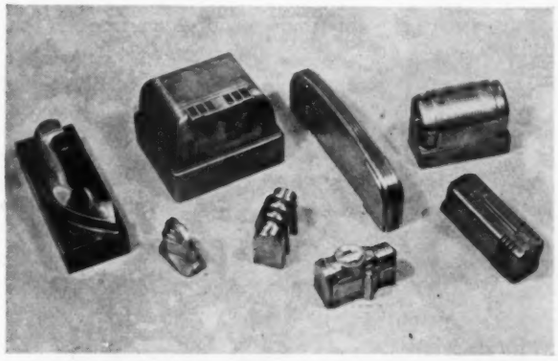
The plant forms only one of four operated by G.E. for plastic production; others are located at Lynn, Mass. (laminated), Meriden, Conn. (urea and cold molding) and Fort Wayne, Ind. (phenolic hot molding, some urea and thermoplastics). Pittsfield handles phenolic hot molding and all injection molding of thermoplastics. Some 324 hydraulic presses range from 2 to 24-in. ram diameters and from 7½ to 1500 tons pressure. At Pittsfield alone are stored 6000 molds with a value of about $2,000,000.

G.E. is still its own best customer for plastics. Electric appliances, refrigerators and radios add to the demand for industrial uses; but custom molding grows daily, takes an ever larger percentage of G.E.'s plastic output.

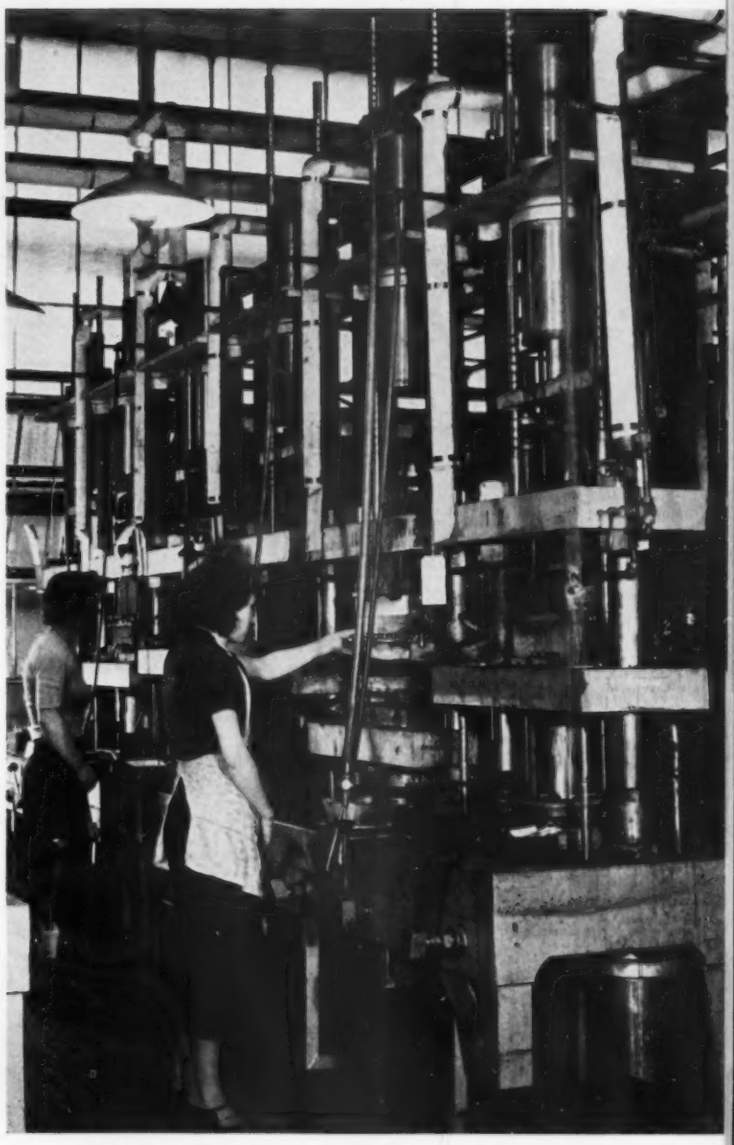
Final finishing of the plastic molds is done by hand under a battery of mercury arc lights. Polishing and engraving are performed with skill to give the high degree of surface quality required in this work



Die bodies are made of machine steel; working surfaces are of case-hardened alloy steel. Many of the surfaces are machined on battery of shapers of which this Hendey is typical



Most of the cavities are made by forcing hobs into the hot die surface under a 1,000-ton hobbing press. Hob making is a ticklish toolroom job as evidenced by the few samples shown here. For hobbed dies, mild chrom-nickel steel (SAE 3110) is used which affords greater plasticity under heat than the higher alloyed metal (SAE 3312) otherwise employed



When the new plant was equipped 68 new presses were installed. To these and to older presses moved from the former location hot water is supplied by a Supertherm system at 370 F. and 190 lb. per sq.in. Curing cycles are arranged to suit the operators' progress

Holes have to be cleaned up and inserts retapped in the finishing room. Here a battery of Buffalo drilling and tapping machines are at work on these operations

Flash and burrs are removed on an abrasive belt. At the end of the cleaning benches, inspectors check the finished parts; an adjunct to the inspection department is a fluroscopic x-ray machine

Fig. 1—Steel racks mounted on six double-wheel casters are readily movable

A Place for Everything

Well-built tool storage racks are no luxury—they pay their way in preventing damage, saving attendant's time

CHESTER H. FRANKLIN

TOOL STORAGE is a real problem especially where a large quantity of drills, cutters and the like are involved. It is equally important to have a place for such materials as drill rod and other small stock frequently needed either in the making of tools or in the product being manufactured.

Methods of storage vary widely from bins or boxes, in which tools are dumped with little regard for the cutting edges, to modern racks with more or less refinement both as to appearance and protection of the tools themselves. One of the most interesting installations of toolroom equipment we have seen was found in a large plant which prefers to be nameless but which has afforded the opportunity of illustrating a typical tool crib.

The racks shown are of steel, as is all its tool-crib equipment. They are of substantial, welded construction, with the unusual feature of being mounted on six double-wheel casters. These make it possible and practical to move the racks for cleaning the floor and to rearrange them as changes become necessary.

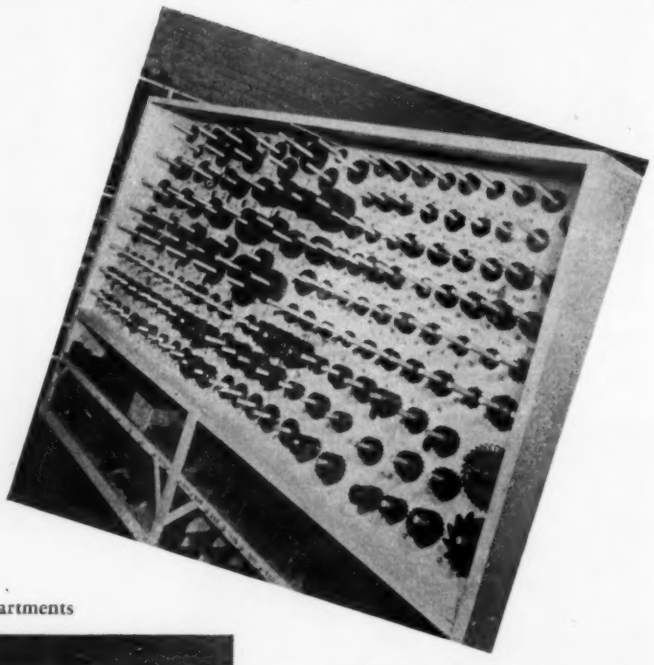


Fig. 2—Heavy milling cutters stand on the lower shelves, lighter ones on pegs above

Fig. 3—Drills and reamers lie in inclined, wood-lined compartments

A general view, Fig. 1, shows three double racks. They are painted white, kept clean of dust by vacuum, and are repainted where necessary. Racks that hold keen-edge tools which might be easily damaged, have a wooden lining to prevent dulling. Figs. 2 and 3 show racks for milling cutters, drills and reamers. Heavy milling cutters are kept at the bottom, as in Fig. 2, while such equipment as screw jacks and toolpost grinders find resting places as in Fig. 3. At the extreme right of Fig. 3 near the fence is a special rack for collets used on different machines.

Supplies, such as drill rod, small pieces of steel or similar stock, are kept as shown in Fig. 4. Below the steel is the rack for files, some of which remain in the original boxes until called for. It will be noticed that each compartment bears a number, which is a great help in selecting the files wanted.

Outside the tool crib is a file sample board, as shown in Fig. 5, with each file numbered as well as named. The man who wants a file studies this sample board, finds the number of the file he needs and relays the information to the toolroom attendant. It is an easy matter for him to pick out the file or files wanted, because there is no time wasted because of using different names for the same file or for any other reason.

Rack For "Mikes"

Micrometers cost real money, and care in storing them is absolutely necessary. Many micrometer racks hold the instruments vertically, some holding them on their back and others hanging them at different points on the frame. The storage method employed here is shown in Fig. 6. Each micrometer rests on its side in a separate compartment with the measuring points outside the rack.

Beneath each opening is a number designating the capacity of the micrometer, such as two to three inches for those at the upper right and eleven to twelve inches for the lower right-hand corners. The checks are hung on hooks at the extreme upper left, where the numbers correspond with those under the micrometers themselves. Standard 1-in. micrometers are supplied by the men themselves. These are checked for accuracy periodically in the tool inspection room.

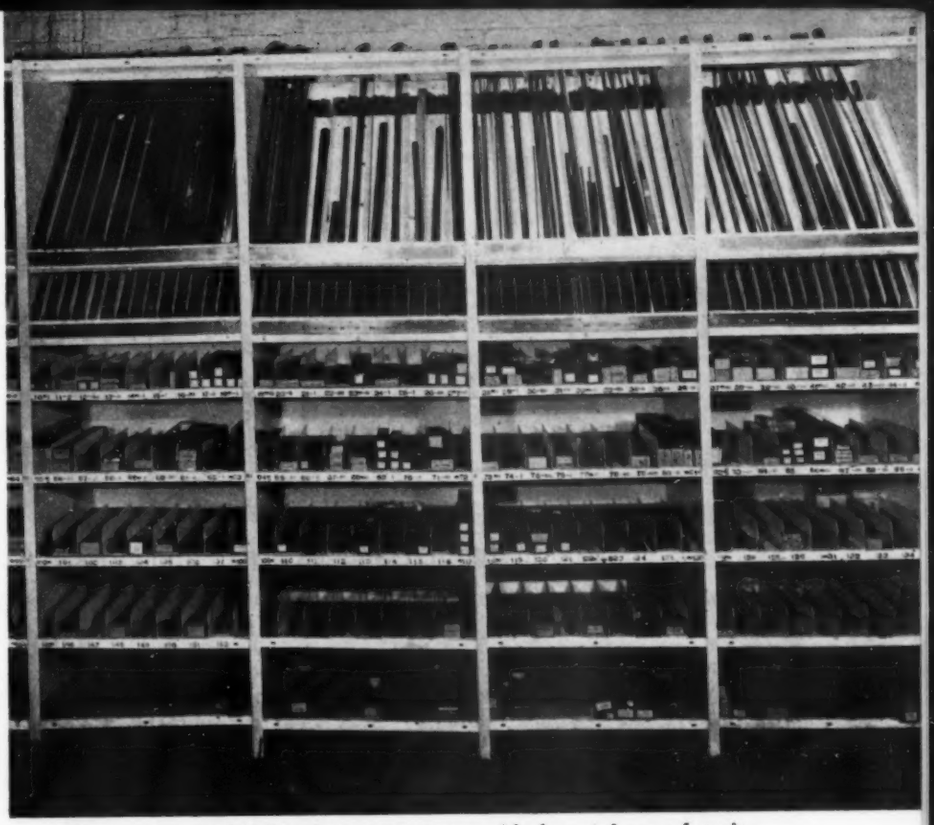


Fig. 4—Contrast this ship-shape arrangement with the usual way of storing drill rod and pieces of steel stock

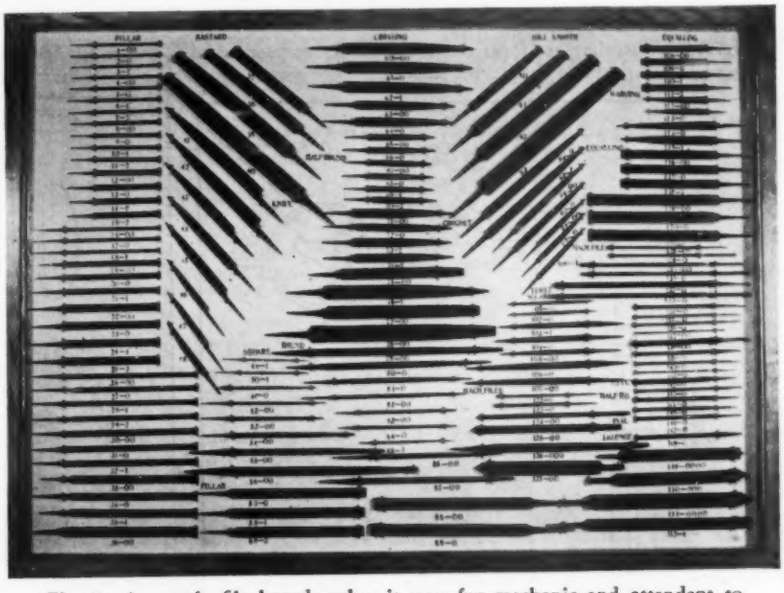


Fig. 5—A sample file board makes it easy for mechanic and attendant to understand each other

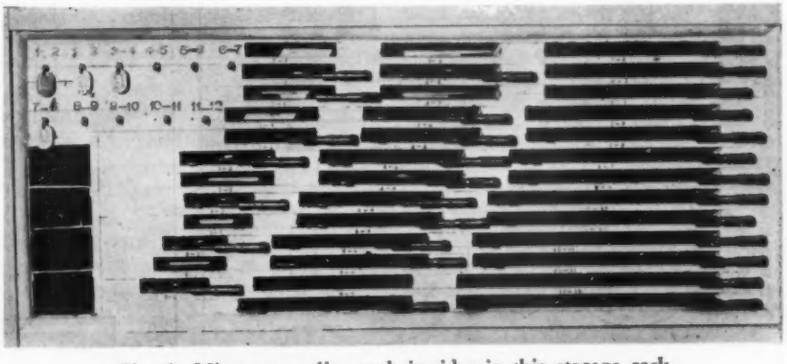


Fig. 6—Micrometers lie on their sides in this storage rack

Air Gages for Checking Accuracy

Both internal and external dimensions are measured by the effect of clearance variation on pneumatic pressure

GAGING OF PARTS, especially in connection with inspection, is a comparative rather than a measuring operation. The exact dimension in inches does not concern the inspector. His job is to see that the parts correspond with predetermined standard within the permissible tolerances.

All instruments for this purpose have multiplying devices so that "tenths" appear as coarse and easily read dimensions. Some simply flash a light for high or low limits and give no direct indication as to the exact size, as anything between the high and low limits is satisfactory.

A new entrant in this field is the air gage for comparing production parts with a standard or master. These gages are built on the principal that:

1. If air under pressure is admitted into a chamber having an open orifice a static pressure condition can be maintained within the chamber by properly controlling the

Fig. 1—In its simplest form the air gage is represented by this portable device for checking bore sizes

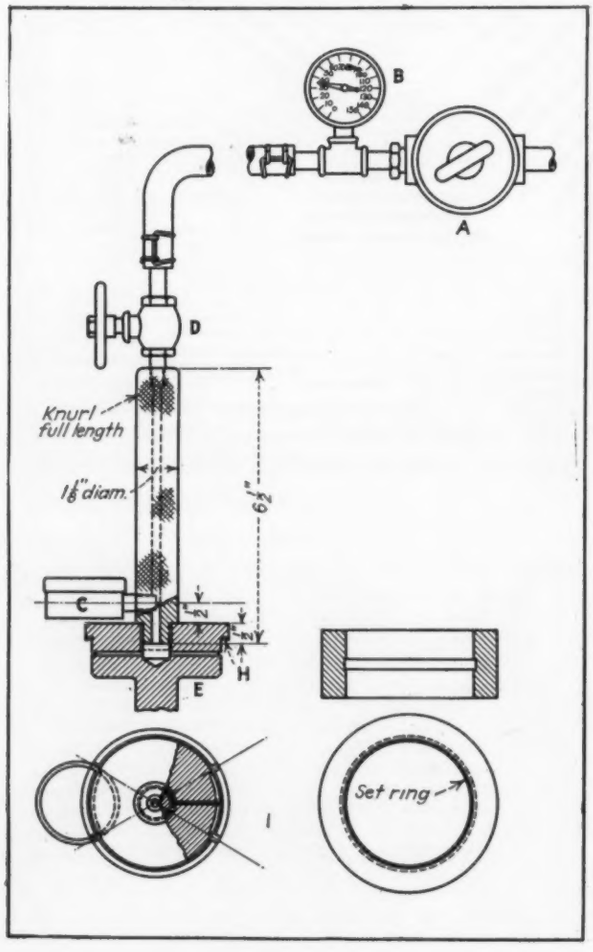
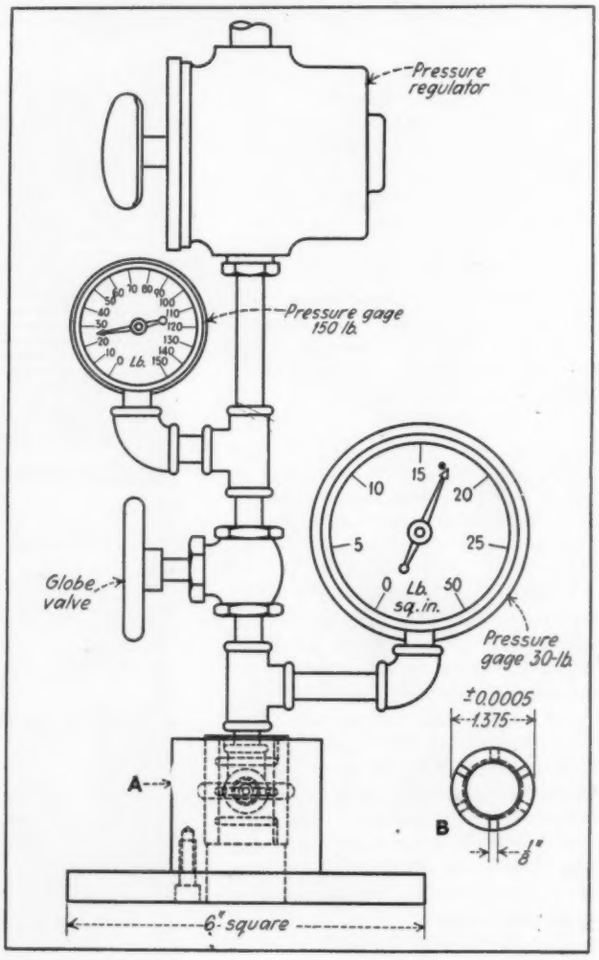


Fig. 3—A variation is this gage which checks the outside diameters of the part illustrated in Fig. 4



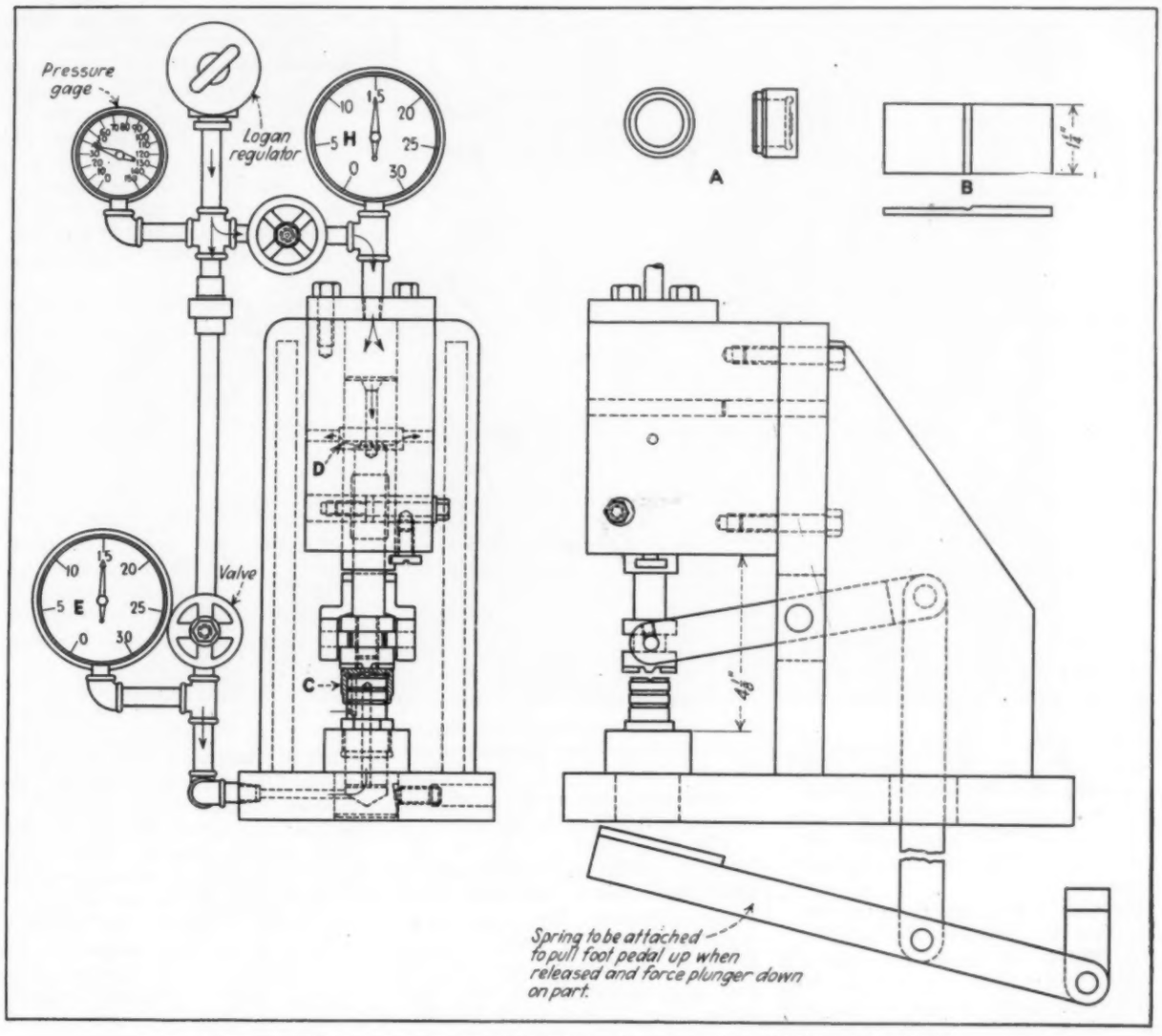


Fig. 2—This gage measures both the bore of a cap and the thickness of its head

entrance pressure and exit openings.

2. After such static condition is secured any further change in the exit orifice will increase or decrease the pressure within the chamber.

3. If the static pressure inside the chamber be set low enough a slight change in the exit orifice has a greater effect on the static pressure than the same change in the exit opening on a high static pressure.

With these principles in mind, the Spicer Manufacturing Company has made inspection gages for use in checking various parts. Some of these gages are illustrated herewith. They are built by applying the rules as follows:

1. The piping and drilled holes in the fixture constitute a chamber into which air is admitted under pressure. A regulating valve in the air line ahead of the fixture constitutes the control on the entrance opening, while the plug or ring by which the piece to be gaged is placed makes the exit opening.

2. Placing the piece to be checked over the plug restricts the exit opening and the resultant back pressure is read on the gage which forms the graduations showing the size of the hole as compared with the master, or standard, by which it is set.

3. The static pressure in the gaging system is set at a pressure low enough to make a change of 5 lbs. per 0.001 in. variation in the hole of the piece being inspected. This gives a wide range of movement on the ordinary 30-lb. air gage. Any desired movement of the hand on the indicating air gage can be obtained by a little experimenting.

Beginning with a gage which is connected to an air hose so as to be moved by hand from piece to piece, as in Fig 1, we have the essentials of this method of gaging. The reducing valve *A* regulates the initial air pressures; *B* is a gage to show initial pressure in the line, and *C* a 30-lb. gage used for checking the exit pressure which determines the size of the piece being inspected. The ¼-in. globe valve *D* admits or shuts off air from the gaging plug *E*. This ring is screwed to the knurled handle, and is easily changed for other plugs needed on work of different sizes.

The plug *E* has two small radial exit holes drilled into the central chamber. There are also small projections around the edge as at *H* to afford an opening for the air that passes out between the plug and the case being measured. The master ring is seen at the right. This has two diameters, minimum and maximum, and is used in determining

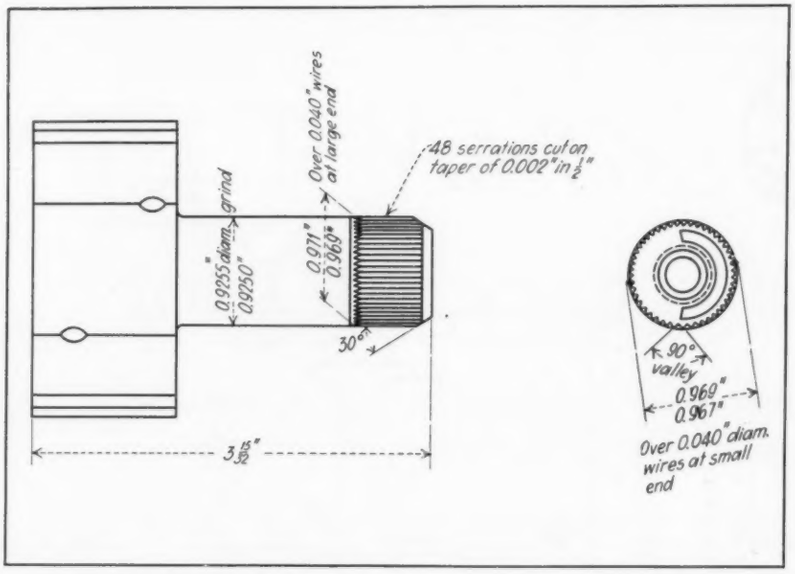


Fig. 4—This shock absorber wind shaft is typical of the kind of work which may be measured pneumatically

where to set the pressure regulator so as to give the desired 5 lb. variation on gage *C* for each 0.001 in. of diameter variation. In this way it is possible to permit fairly wide wear limits on the gaging plug providing the air pressure is altered to compensate for the wear. This increases gage life appreciably and forms one of the economies of this system.

In Fig. 2 is a gaging fixture for checking the bore of a cap and the thickness of its head. The master setting block, which is a duplicate of the cap itself, is seen at *A*, Fig. 2. This is used in setting the air pressure for checking the internal diameter. The stepped plate or block *B* is used in setting the gage to check the thickness of the head. This gives both upper and lower limits of head thickness. The inner diameter of the caps varies from 0.769 to 0.996 in. Gage plugs for each of the ten sizes can be readily put into the machine.

Exit passages for checking the diameter are seen at *C* and for the check on head thickness, at *D*. Separate gages, *E* and *H*, are provided for each size to be checked. The side view shows how the plunger is controlled by a pedal, which leaves both of the operator's hands free to handle the work on and off the plug. This arrangement makes rapid inspection possible.

Both of the gages shown have been of the plug variety. The same method can, however, be used for shafts as in Fig. 3. The part itself which may be seen in Fig. 4 is the wing shaft for a shock absorber, and the gage inspects the shaft diameter below the head. In this connection, it is interesting to note the use of wires to measure the diameter at the serrated end of the shaft. The dimension is given as measured over two wires 0.040 in. in diameter.

The ring gage is held in the block *A* which is screwed to the base plate over a hole that gives ample clearance. The ring gage itself is shown at *B*, which is given in detail so that the air vent, or exit, dimensions can be seen. The dotted lines of the pipe connection behind the gage holder show that the gaging is done in front of the upright piping which carries the gages and the reducing valve.

The accuracy with which this method will check work that can be handled in this way, can be judged by noting the graduations on the gage dial. This is a 3-in. dial and the 5-lb. marks are over an inch apart. Recalling the specifications that 5 lb. equals 0.001 in., the variations that can be checked are much finer than is needed in most manufacturing.

Several other concerns are using instruments that work on a similar principle, and they are giving excellent satisfaction. Another application in the Spicer plant is to check the squareness of holes and faces. It has been found that the best pressure to which the regulator should be set varies with the job being checked and the size of exit vents that are found desirable. Checking the pressure and the gage setting by means of the master ring or plug at frequent intervals, insures inspection that will be satisfactory.

In considering the gaging by the use of air we must not overlook the work of A. P. Steiner and his associates in connection with the Landis grinder. This method uses an air pressure of only 2 lb. per sq. in., the jet impinging directly on the work being ground. When the proper diameter is reached, which is determined by the use of Carboloy faced V-blocks, the pressure built up in the line behind the jet raises the mercury in a switch that controls the grinding wheel. Strangely enough, the same method was developed in France at about the same time, another instance of simultaneous invention.

Don't Miss the New Hinman Series

EARLY in 1938 C. W. Hinman, tool engineer of the Kobzy Tool & Electric Manufacturing Company, will begin a new series of articles on the "Press Working of Metals." His first series, recently concluded, covered principles to employ in designing drilling and milling jigs and fixtures.

The same practical approach will be used by Mr. Hinman in the coming series. He will draw from his own ample experience, and will enjoy the assistance of many press builders and die engineers. He will start with concise descriptions and illustrations of all the presses now in common use. Characteristics, fields of application, and the tonnage ratings of these presses will give the production man and the tool designer a better appreciation of what can be done with the shop equipment available. Following this material will be a number of articles on the application of numerous press tool elements to all common types of punch and die sets.

"Press Working of Metals" will be a regular feature of *American Machinist* for many months. Each article in itself will form a complete unit crammed full of practical ideas on the processing of sheet metals. Taken together, the series will form a well-rounded presentation of the subject.

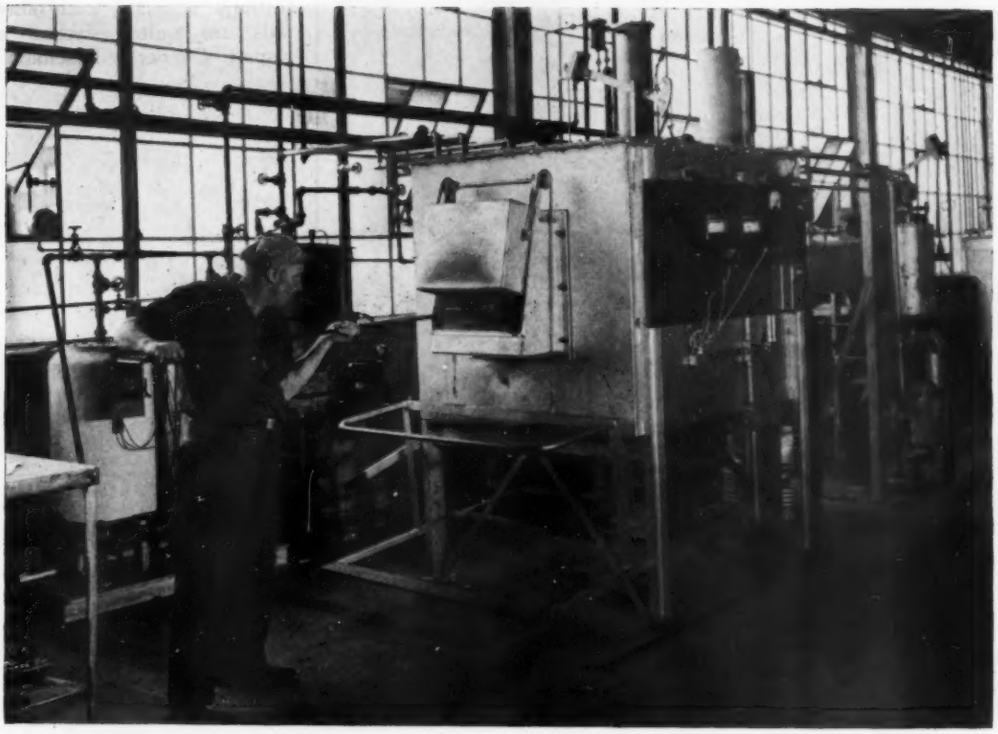


Fig. 7—Work to be brazed in a box-type furnace is loaded in trays or baskets. Care must be taken that assemblies do not touch, as they may become brazed together

Electric-Furnace Brazing—II

Design of joint and quality of surfaces to be joined are controlling factors in determining the efficiency of a brazed joint

H. M. WEBBER
Industrial Department, General Electric Company

BRAZING-METAL will creep best and farthest on a clean, roughened surface because of capillary action. Molten copper will wet clean polished steel, but it will not have a tendency to creep out on its surface and distribute itself, even in the presence of the protective atmosphere in the furnace. If this surface be roughened by shot blasting, rough grinding, pickling or some other process, the copper will spread out in a thin film and tend to distribute itself evenly over the surfaces of the joint.

Surfaces of steel which are oxidized become reduced by the hydrogen in the furnace atmosphere at copper-brazing temperature, leaving a clean, white matte finish which serves as a good surface for distributing the copper. Oxides within joints are not easily reduced, however, and some trouble may be expected in getting a good braze when oxidized surfaces are used.

For best wetting action the surfaces of assemblies should be perfectly clean. Heavy oil or drawing compounds should be removed. Light oil can sometimes be left on the parts, particularly if the oil distills readily and leaves no carbon which would hinder wetting.

Lead-bearing lubricants should be avoided, because, in general, their presence completely prevents the flow of brazing-metal into the joints. Stock previously rolled or drawn with such lubricants has a skin which offers poor response to the wetting action of molten copper. Copper-brazed joints that contain lead are also weak and brittle.

Sometimes it is desirable to limit

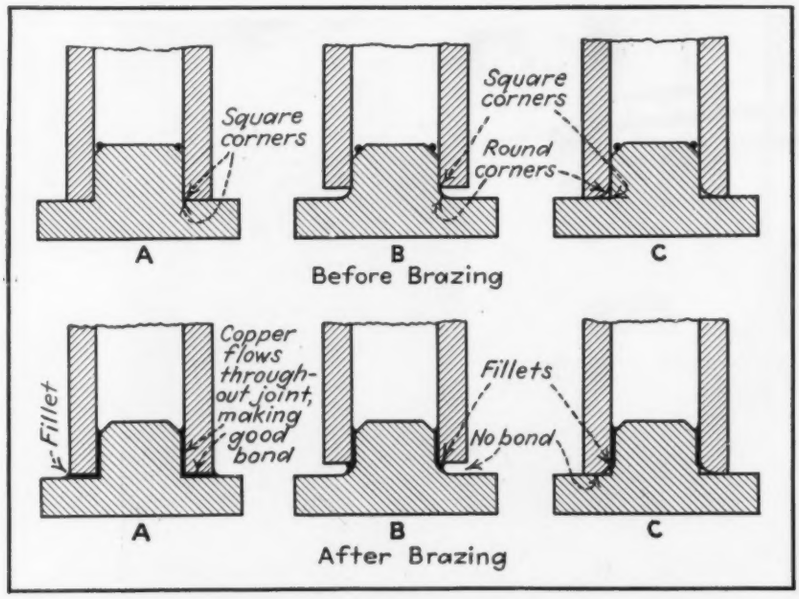
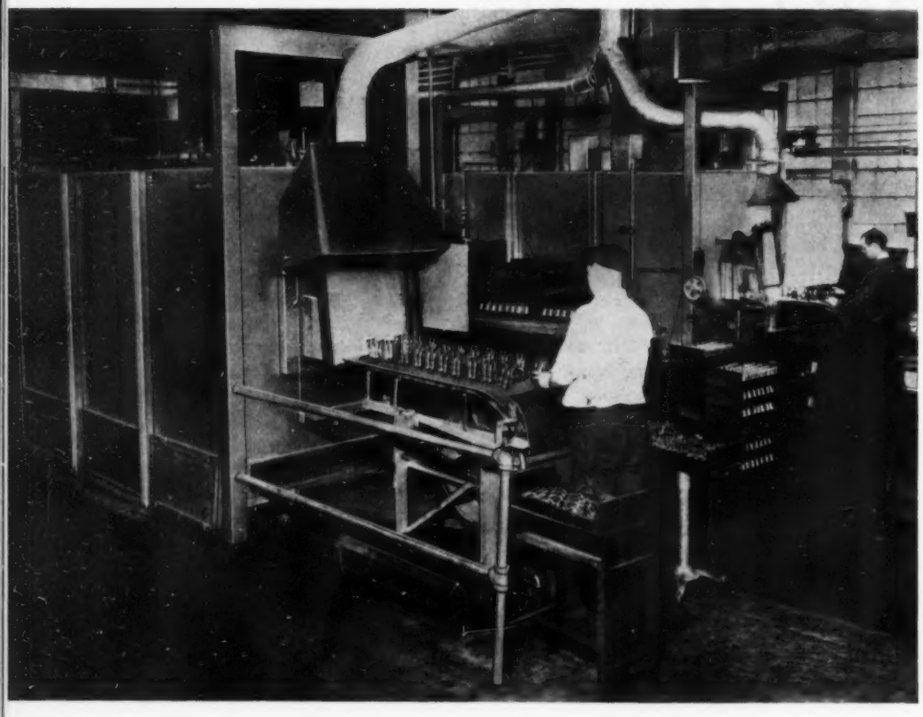


Fig. 6—Parts must be made so that there will be no gaps at corners within the joints to interrupt the capillary action

the spreading of the brazing metal so that it will not reach certain areas of the assemblies. The nature of each particular job determines which, if any, of several schemes can be employed. Often the use of highly polished steel stock will confine the copper to the area immediately surrounding the joint. Grooves and recesses in the joint will sometimes confine the copper to the restricted area, as the surface tension of the copper causes a tendency to form fillets at these points.

Frequently limitation of time of heating will sufficiently control the spread of the copper. Control of hydrogen content in the furnace atmosphere will, in some cases, control the creeping tendency of the copper.

Fig. 9—Mesh-belt-conveyor-type furnaces are used for copper-brazing and bright-annealing refrigerator parts. Work can be loaded directly on the belt



Chromic acid and some other materials are quite effective in this respect. Copper will seldom pass a barrier of chromic acid. However, if it is applied to oxidized surfaces, the copper will creep beneath the acid through the reduced-iron skin.

Design of joints should be such as to eliminate any gaps at the corners within the joints, as outlined in Fig. 6. This shows joints having good contact throughout, as at *A*, a round corner on the plug and a square corner at the end of the tube, as at *B*, and the opposite condition, as at *C*. Fillets form readily once a gap is reached.

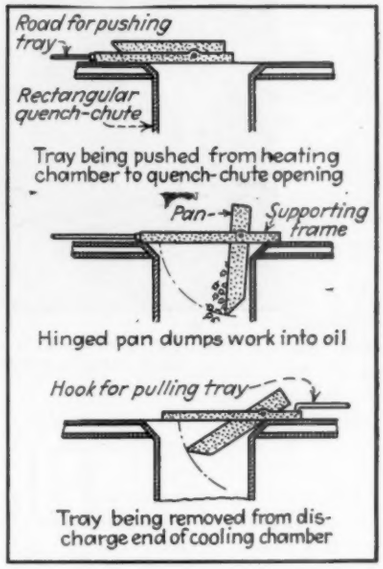

Road for pushing tray
Rectangular quench-chute
Tray being pushed from heating chamber to quench-chute opening
Pan
Supporting frame
Hinged pan dumps work into oil
Hook for pulling tray
Tray being removed from discharge end of cooling chamber

Fig. 8—Hinged-bottom trays automatically dump heated parts into quenching oil through a rectangular opening in the bottom of the cooling chamber of a box-type furnace. Scale-free hardening is accomplished economically with this arrangement

A variety of forms of brazing-metal can be used, such as wire, foil, slugs, electroplate, molten spray and paste. The choice depends on a number of factors which are related to the size and shape of the assembly and the joint, accessibility for applying the brazing-metal, quantity of brazing-metal required, desired appearance of the joint and cost. Each job must be carefully considered in the light of each of these factors.

Hollow receptacles, such as floats and receivers, must be properly vented in order to secure best results in the furnace-brazing process. These assemblies enter the furnace filled with air but the furnace chamber is filled with a protective atmosphere in which hydrogen plays an

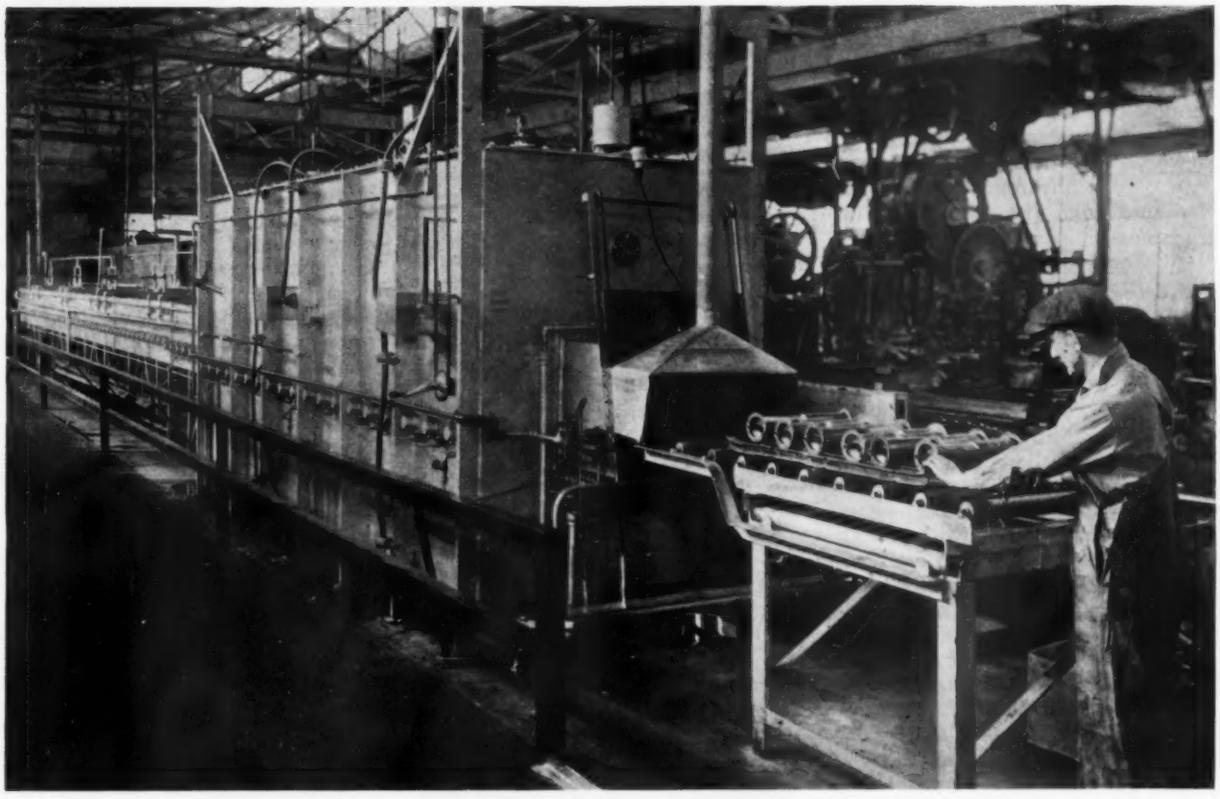


Fig. 10—Work put through roller-hearth-type electric brazing furnaces is loaded on rails or trays. High operating economy and low maintenance cost is possible

important part. The furnace is naturally hot and, upon entering the furnace the air inside the assembly expands rapidly. Unless a vent is provided the members of the assembly are apt to be forced apart.

Consideration must be given to proper location of vents, in order to assure a good protective atmosphere inside, as well as outside the hollow bodies. Best results are obtained when vents are at the bottom, as this permits purging the container of the air, water vapor caused by burning of the air and oil vapors resulting from oil in the container.

If the vent is at the top, heavy vapors will remain within the assembly and the joints may be poorly brazed. Better results are obtained when the vent is at the side, but even then the heavy vapors may lie in the bottom and cause trouble.

Most of the S.A.E. standard steels are usually joined by using copper as a brazing-metal. Limitations with respect to time in furnace and furnace temperature are relatively wide for these materials. The addition of a flux is seldom required. Flux helps the wetting action and the flow of brazing-metals on alloys containing chromium, silicon, aluminum, manganese and zinc. Its use is avoided, when possible, because of the deposit it leaves on the metal surfaces.

Stainless steel and other high-chromium alloys sometimes can be brazed with best results when using "Easy-Flow" silver solder, which flows at 1,175 F. and is used with "Handy" flux. Both of these materials are furnished by Handy and Harman. Brazing temperature is low enough to avoid formation of objectionable chromium oxides and there is less chance of carbide precipitation to impair the "stainless" property.

Special consideration is generally required to furnace-braze cast iron, which is not easily wetted by the molten brazing-metal because of the formation of silicon oxide and because of the high concentration of carbon in the iron. Silicon oxides are formed by impurities in the furnace atmosphere and these are not reduced by the hydrogen.

Wetting action can sometimes be improved by using a flux. Another scheme is to first oxidize, then reduce the surfaces of cast-iron parts prior to assembly for brazing. The inclusion of nickel as an alloying element in the cast-iron is helpful in improving the wetting action, because of the good affinity of nickel and copper.

Another factor to be considered is the effect of the furnace-brazing cycle on the structure of the cast-iron. When the iron, in going through the cycle reaches a temperature of 2,050° F., or above, it generally comes out with a very hard skin. This can be avoided if a low-temperature brazing-metal, such as a brass or silver brazing-alloy, is used instead of copper.

Cast-iron with high concentrations of carbon has a low melting point. Care must be taken, when copper-brazing, to use as low a furnace temperature as possible to avoid melting localized areas. If the joint is long or deep, requiring the brazing-metal to flow more than $\frac{1}{4}$ in., it is generally advisable to embed the brazing metal within the joint.

A wide variety of fluxes are available for use with metals that are difficult to wet. A few simple experiments will determine the desirability of any particular flux. If the brazing-metal is copper or brass, typical materials used as fluxes are: dehydrated borax, dehydrated borax plus boric acid, or Cryolite (sodium aluminum fluoride).

These fluxes generally leave a deposit on the work after brazing. Borax or borax plus boric acid leaves a hard glassy deposit which adheres firmly to the metal and requires a stiff wire brushing or chipping for removal. Cryolite leaves a deposit which forms hydrofluoric acid with moisture from the air, setting up corrosion.

When brazing steel with copper there is some enlargement of grain size, due to the high temperature used. For most applications this is not objectionable. There are cases, however, where a fine grain structure is desirable. Reheating through the critical range, using either a regular normalizing or hardening cycle, or both, generally will refine the grain.

Parts can be carburized either before or after the furnace-brazing operation. If carburized before brazing, precautions are generally taken to minimize or prevent surface decarburization. The assemblies are usually plated with about 0.0005-in. of copper, moisture is removed from the gas used as the furnace atmosphere and the carbon-dioxide content of the gas is kept low.

In addition, it is desirable to carburize with a fairly heavy case, with high concentration, in order to compensate for loss of carbon by diffusion into the core. By carburizing to a depth of 0.030 in., with a concentration of about 1.2 per cent carbon, and by taking the precautions mentioned, manufacturers are able to get file-hard surfaces on copper-brazed, carburized assemblies where brazing time does not exceed 15 min.

Brazing Furnaces

Copper-brazing furnaces of a number of types are available, but the ones most commonly recommended are the box-type, the mesh-belt conveyor type and the roller-hearth type. Box-type furnaces are suitable for use where production quantities are low and for experimental work on assemblies of all types. In this type furnace work is loaded in trays or baskets, care being taken that assemblies are properly supported. The furnace shown in Fig. 7 has a 38-in. long heating chamber and an 87-in. long cooling chamber. Three trayloads of work can be held in the cooling chamber while one is being brazed in the heating chamber. A sliding refractory door minimizes heat losses.

Where the box-type furnace is to be used for scale-free hardening, in addition to copper-brazing operations, a quench chute is provided in the bottom of the cooling chamber, near the entrance from the heating section. Parts to be hardened are loaded on trays having hinged bottoms, Fig. 8, and are dumped through the chute simply by pushing the trays over the chute opening. Empty trays are then removed from the discharge end of the cooling chamber. Bright-annealing and pack-carburizing operations also can be accomplished in the box-type furnace.

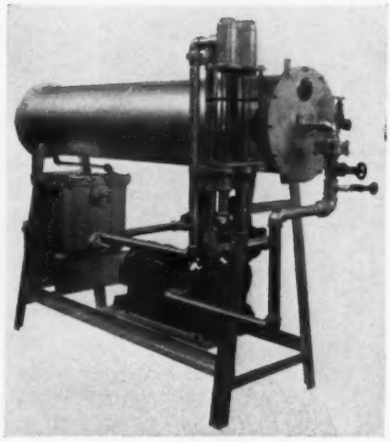


Fig. 11—A gas-air mixture is burned in the combustion chamber of this furnace-atmosphere controller to produce a protective atmosphere for copper-brazing furnaces

Work may be loaded directly on the belt of a mesh-belt conveyor-type furnace, Fig. 9, but the parts which will roll or tip over must be supported by auxiliary fixtures. After assemblies are loaded on the belt at the charging end, they are carried through the heating chamber into the cooling chamber at a steady rate. Work is removed from the conveyor belt at the discharge end by an operator, or it can be dumped into tote boxes or onto another conveyor.

Exhaust hoods usually are provided at both ends of the furnace to carry away the products of combustion that escape through the doors. Since the doors are open all of the time, atmosphere gases are kept burning at the openings in order to consume oxygen from the air that tries to enter the furnace. Illuminating-gas flame curtains help maintain a non-oxidizing atmosphere within the furnace, although such flames are apt to discolor lightweight work leaving the furnace.

Assemblies to be copper-brazed in a roller-hearth furnace, Fig. 10, are loaded on rails or trays which are carried through the heating and cooling chambers by driven rolls. Operation of this type of furnace consists of: (1) setting up rails or tray on a roll table at the charging end, (2) mounting the work on the carriers, (3) raising the furnace door, (4) pushing the charge into the heating chamber onto live rolls provided with over-running clutches and, (5) lowering the door. Charges are removed intermittently by an operator at the discharge end. Rolls are kept rotating continuously throughout the heating and cooling chambers, moving the work through the furnace at a steady rate.

Atmosphere Gases

Although hydrogen makes an excellent atmosphere for brazing furnaces, as does dissociated ammonia, which is 75 per cent hydrogen and 25 per cent nitrogen, the most commonly used gas for furnace atmospheres is an inexpensive mixture formed by the partial combusion of natural gas, coke-oven gas, butane or propane. The composition of this mixture can be varied, but for furnace brazing it is generally about 17 per cent hydrogen, 11 per cent carbon monoxide, 4 per cent carbon dioxide, 2 per cent methane and 66 per cent nitrogen. This gas costs from 10 to 50 cents per 1,000 cu. ft. and produces satisfactory results.

A combusion-type, furnace-atmosphere controller, suitable for the production of a gas mixture like that described above, is shown in Fig. 11. In this unit a motor-operated mixer maintains a constant input gas-air ratio and pressure regardless of the load. This mixture is passed into a combustion chamber where it is burned. Products of combustion pass through a surface cooler to remove most of the moisture by condensation before they are passed into the furnace chambers to form a protective atmosphere.

Cyanide Hardening

Cyanide hardening has both advocates and opponents. Among the former is E. F. Davis, chief metallurgist of the Warner Gear Division of the Borg-Warner Corporation, probably the largest builders of automobile gear transmissions in the world. This company has used SAE 4640 alloy steel and cyanide hardening since 1932 and found it superior for their uses to oil hardening. It is a medium-carbon type of nickel-molybdenum steel that forges and machines in a satisfactory manner.

Wage and Hour Legislation

Industry wants increased employment, more mass purchasing power, elimination of sweatshops, but does not believe that government regulation of wages and hours will bring them

WILLIAM J. KELLY
President, Machinery and Allied Products Institute

HIGH TIDE IN America's faith in legislation as a panacea for all the country's ills probably has passed. Before complete recession and a return to encouragement of the normal, more dependable sources of real progress, employers in business and industry find it necesary to take the unpopular side of the wages and hours question. We are warned that the controls under discussion are but the first step in plans for more rigid legislation—that far more control is the ultimate objective, to be reached by successive pieces of legislation in the future.

It is difficult if not impossible to make legislators and the public believe that business and industry have any other reason for opposing legislation of this type than a demonic desire to exploit labor. The first plank in industry's policy on the question then seems to be to remove this mistrust as far as possible. Business and industry desire increased employment, more mass purchasing power, elimination of sweatshops and similar unhealthful and unsocial conditions which the proponents of this legislation speak of so idealistically. If there is agreement on that, the question becomes one of methods of attaining the desired ends.

Let us consider the Black-Connery Fair Labor Standards Bill just rejected by the House and sent back to the Labor Committee. Discussions of this bill with individuals and in group meetings have convinced me that a very small percentage of the population knows just what this bill proposes or the tone in which it proposes it.

Even the most ardent supporters of the Black-Connery Bill at the

Joint Senate and House Hearings during the last session of Congress revealed their lack of confidence in the bill attaining the objectives claimed for it. Arguments that it would increase employment by reduction of hours had to be qualified by such statements as: "if employers do not find it more satisfactory to let the present employees work additional time at the provided time-and-a-half rate instead of putting on new men;" or "if small employers whose profits are not sufficient to stand increased labor costs are not forced out of business, thereby depriving some workers of any employment at all."

Qualifying Statements

Arguments that the bill would increase purchasing power had to bear such qualifications as: "if prices do not advance;" or "if it does not raise production costs to such an extent that foreign competition is increased." The qualifications, of course, loom even larger in the minds of practical men in business and industry.

A number of advocates of legislation to prevent child labor said the problem would remain unsolved even if this bill were passed, and a nationally known authority on the subject recommended that the child labor provisions be stricken out because they were unworkable.

On the improvement of extremely low wages in isolated cases, testimony brought out that the most serious problems are in the service trades, in agriculture and in other occupations not covered by this bill.

Organized labor presumably knows what the working man needs and desires, yet the American Federation of Labor is fighting for the defeat of this legislation, principally on the grounds that it would interfere with the free relationships between employers and employees and would prevent collective bargaining.

Study of the testimony given by the supporters of this kind of legislation cannot help but leave one with the conviction that what they desire is control of business and industry by government more than real solutions to the problems to which the bill is supposedly directed. An inescapable conclusion is that there seems to be no one who really believes that the bill would accomplish what it proposes to do.

Business and industry have a fear of government regulation, and it is founded on experience. Mushroom growth of it in the past has been too common. It should be clear to any far-seeing analyst of legislation such as this that it must eventually lead to government control of prices and

numerous other competitive factors. It is a step toward the removal of the variables in business and industry—a step toward a static society which every business man and industrialist must oppose. Social planning, by direct reference and implication, runs throughout the testimony of those most in favor of this kind of legislation.

The Black-Connery Bill seems to be based upon the assumption that government alone, and particularly in contrast to employers, has the desire and the ability to protect workers and the public from exploitation. It behooves business and industry to make and keep legislators and the public aware of the fact that the successive advancements of progressive business and industrial organizations establish the standards which the legislators would attempt to reach by laws. Progress is led by business and industry, not by government. The legislators follow in the wake of the progressive movements made by outstanding employers. This has always been the case, and there is no reason to believe it is different today or will be different in the future. In dealing with legislators and the public, emphasis of this too commonly overlooked fact may well become the second plank in our policy on wage and hour legislation.

Cooperation vs. Conflict

Closely allied to this question of the sources of progress is the question of cooperation versus conflict in attaining our American ideals. A Southern employer testifying at the hearings on the Black-Connery Bill, said: "No country ever went forward when people regarded one another with hatred and strife. If we cannot achieve our destiny as a united people we cannot achieve it at all. I resent the statement on the part of any man that because I am an employer I am not so constituted that I can be a sincere friend of the man who works for me and with me. I resent it, sir, and I know our country cannot move on that way." This point should need no amplification. The man on the street, as well as every employer in the country, cannot help but subscribe to this doctrine if he believes in democracy. It deserves a position as the third plank in our policy on legislation of this type.

My purpose in this brief article has been only to outline basic principles. Every employer, or spokesman for the business and industrial point of view, can find in his own knowledge and experience methods of bringing these points home to those who seek to shackle America's sources of employment and purchasing power with regulation. First, approach your legislators and the public with clean hands and remove all doubt as to our desire for improvement of our country. Second, make it clear that business and industry, not government, is the source of progress, employment, purchasing power, high standard of living and almost everything else which is sought in misdirected legislation of this type, and that to attain progress business and industry must be encouraged, not hamstrung. Third, drive home the importance of cooperation in the attainment of any national ideal and show the danger of legislation based on hatred, distrust or an acceptance of strife.

Adoption of these policies and action upon them by employers throughout the country will not only save business and industry from the stagnating influences of regulation, but it will contribute to the industrial and social progress we all desire. That progress of itself will breed out the weaknesses in our economic and social system, just as other evils have been eliminated in the past.

Dangers of Federal Control

THERE ARE serious fundamental legal objections to the validity of the wage-hour bill, arising from the cases which invalidated the NIRA and the Bituminous Coal Act, each of which undertook indefensible delegations of authority and controls over wholly local production under the guise of regulating commerce. Apart from these, discussion has developed the most serious practical objections. It seems an impossible task for any Board to fix hours and wages for the industries of the United States. Fundamental differences in a country as large in extent, as varied in climate, economic development and social conditions present overwhelming objections. For the differentials which exist are not merely sectional; they are not, as has been suggested, differences between the North and South; they represent the difference between the conditions of production and service in large and small communities, in areas with cheap and convenient access to raw materials and those which have neither, differentials between large and small operations, between the new and struggling and the old and mature industry, between those first regulated and those which, by the very nature of the task, could not be reached for a long period of time.

These are but a few illustrative suggestions. There is, too, a fundamental difference between fixing minimum wages and regulating maximum hours. The former under many circumstances may have a comparatively slight effect upon cost and price. The regulation of the latter may profoundly affect the whole volume of production and thus the very standard of living. It is not a mere nominal increase in wages that enlarges purchasing power and raises living standards, for if the per capita volume of production increases and costs and prices rise the purchasing power of the wage earner is lessened rather than increased. If it is income that is moved from one group to another no change is made in the volume of buying power but only in its possessors.

I know it is said that however unsound and unworkable the Federal regulation of hours and wages, it is apparently "inevitable" and therefore the unsound principle should be accepted and an endeavor made to minimize its injurious application. Let me remind you that the measure was regarded as equally inevitable when it was proposed. The political influence which halted its operation was the widespread public perception of its fallacies and potential injuries. It has faltered in the face of critical examination. The more it is discussed the more its fundamental defects of law and economics become visible.

It is said that the objectives sought through federal control of employment relations are so desirable that they deserve general commendation, but objectives are not the only consideration in our social as well as our individual life. We cannot forget that the worst of all places is proverbially paved with good intentions. Methods and means are as important as ends. We recognize that in all the daily affairs of life. Surely, nothing is more commendable than the effort of a young man to provide for the declining years of his aged mother, but, however worthy his objective, we have yet to find the modern moralist who defends the separation of a citizen from his wallet as a commendable means of accomplishing the young man's objective.

From a recent address by James A. Emery, general counsel, National Association of Manufacturers.

TALKING SHOP

Old Stuff

The annual meeting of the A.S.M.E. brought together many outstanding engineers, and naturally provided a forum for many interesting discussions. Back of the scenes members exchanged yarns about their experiences and compared notes on all sorts of common problems. Some of them cannot be told, of course, but others are set down here for the benefit of *American Machinist* readers.

One discussion had to do with so-called "temporary" dies which have proved so useful for small runs. The story was told of one of the biggest and best managed metal-working plants in the country that it fell for the exclusive method of one exponent of such dies and paid him a substantial fee for his process. When the process got into the tool room two of the older toolmakers promptly spotted it as practically identical with a method they had used in that same tool room many years before.

Just how such a situation could have been prevented it is hard to see. The method was well known to a couple of the older men but there had been no occasion to use it for so long that everyone else had either forgotten about it or had come into the organization since its use and therefore knew nothing about it. Apparently there is always going to be reinvention, and some few are going to capitalize on it.

Perpetual Motion

A Southern engineer passed along this tale about the inventor of the Fulton Sylphon thermostatic metal bellows which many industries have

used to great advantage. The inventor constructed a clock, as nearly frictionless as possible, and substituted one of these units for the spring. It was so arranged that the expansion of the bellows caused by the rise in temperature during the daytime generated enough power to keep the clock running for 24 hours.

He applied for a patent but the examiner took one look, grunted "Perpetual motion," and threw out the application. Now of course the perpetual motion principle was not involved. The clock was powered by solar radiation, if you like. But the inventor was never able to get reconsideration of his claim. So far as our informant knows the clock is still running.

More per Shot

Molding machines for plastics, particularly the injection type, are approaching the strength of forging machines in regard to heavy members, and drive equipment. In comparison with the older European types, modern American machines

appear like giants and will inject 4 to 5 times as much material per shot. Whereas foreign machines will inject about 1½ oz. per shot, machines now being built in this country will handle up to 8 oz. per shot.

One of the very largest molding machines has opposed horizontal injection plungers acting on opposite sides of the mold. A central column supports the vertical ram for opening and closing the top half of the mold. This machine weighs many tons.

Standards and Savings

In a general way most people know that the engineering societies are paying a lot of attention to standardization, but the A.S.M.E. standards luncheon really emphasized the stupendous amount of technical talent that is being freely contributed to the cause. Most of the seventy-odd members attending were chairmen of one technical committee or another, and committees on an average have twenty to thirty members. Of course, many engineers serve on more than one committee, but even so the manpower represented is amazing. Twenty technical committees contribute to the sectional committee on Small Tools and Machine Tool Elements alone, and other sectional committees have almost as many divisions. If as much effort were put into applying standards as in compiling them, industry would show some real savings.

House Cleaning

Satisfactory as to results, although perhaps not so commendable in principle, was a strike experience of a company of moderate size. It happened some months ago but word of it has just reached us.

The story is that of a small sit-down strike that affected one building of the plant. All sorts of expedients were tried to get the sit-downers to see reason. Finally they were ordered by their union president to get out but they flatly refused. He sent one car of strong-arm men to prove he meant business, but they couldn't get into the building.

With the sit-down still in force 24 hours later he sent the men an ulti-

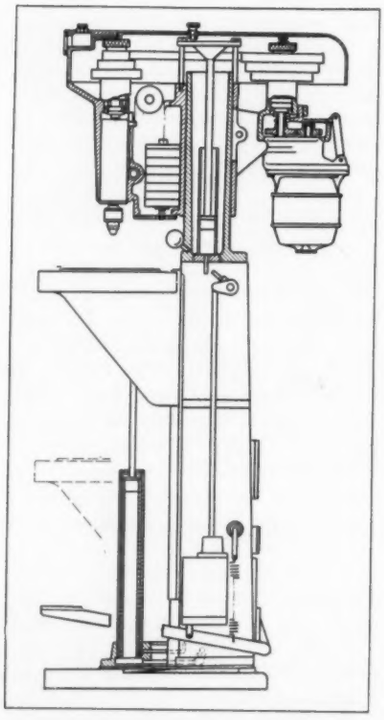
matum, and followed it up by sending two cars with twice as many bouncers. They forced an entry and the strikers quit. But the recalcitrants were not allowed to leave the building until it had been cleaned from top to bottom and was in apple pie order. Then they were marched out.

Poetic justice, perhaps, and maybe somewhat humorous, but in principle very bad indeed.

The Editors

MACHINE TOOLS AT THE PARIS FAIR

ALFRED WASBAUER
Malaunay, France



The schematic section through a floor type drill of Olivetta design shows how the table is displaced hydraulically through a pedal, while, as below, the head is displaced vertically by a lever acting through the same system

Deep holes beyond the range of the quill are reached by hydraulic vertical displacement of the head with the long lever. Other features of this Officina Mecanica Olivetta sensitive drill (Italian) are eight speeds to 10,000 r.p.m., and a ball-bearing sensitive feed lever

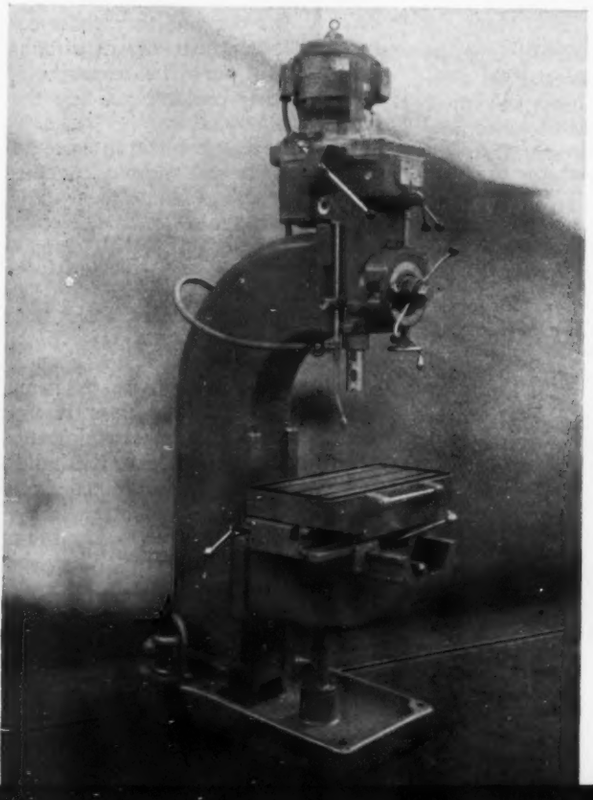
PARIS—Although there are nearly 100 official buildings and foreign pavilions at the Paris Fair, not one is devoted exclusively to machine tools. Exhibits are scattered among the foreign pavilions, the Center of Trades buildings, and the pavilion of Applied Mechanics located within the Annex at the Porte Maillot.

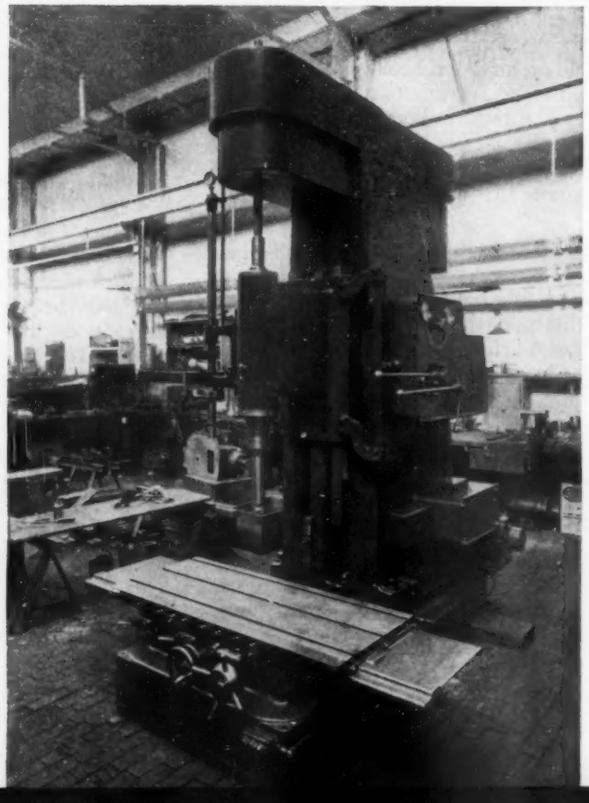
Heretofore, French machine tools have lagged behind in development. The last few years have witnessed the reorganization of many large companies which now have more working capital and more forward, more efficient organizations. As a direct result, French machine tools are coming abreast of the foreign product in nearly all comparable cases. In some few cases they show considerable ingenuity and departures from practice elsewhere.

Where only ten years or so ago a tolerance of 0.05 mm. was considered accuracy. Today many French ma-

Cylinder blocks are finish bored on this Bordier & Gromadzinski machine, using a single carbide tool. Precision of 0.0002 in. in diameter, cylindricity and circularity is guaranteed. Machine has hydraulic feed and eight spindle speeds, and will bore diameters from 1 to 5 in.

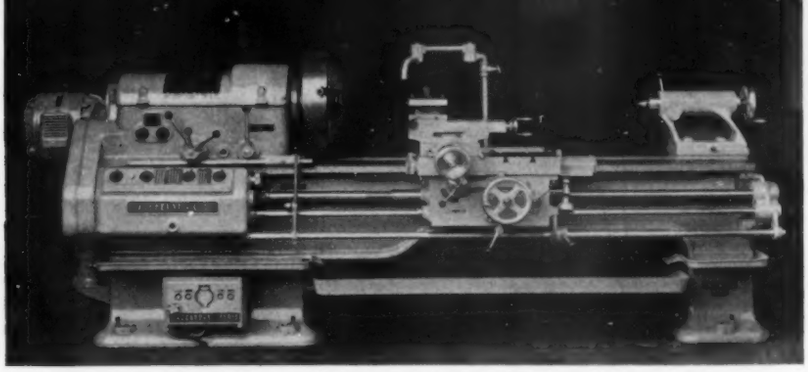
Guillemin-Sergot-Pegard have placed a head from a radial drill on a gooseneck frame to afford a powerful upright drill. Table is positioned by hand



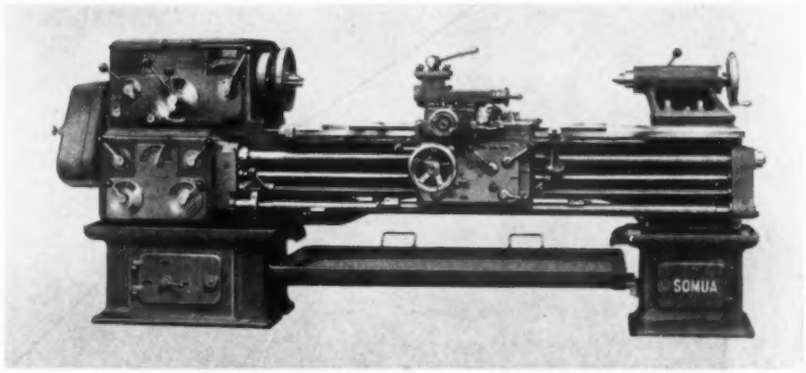


chines permit tolerances of 5 microns (0.0002 in.). As in modern American machines, beds and guides are made of alloy cast iron or are faced with heat-treated ground steel plates. Speeds have increased in keeping with the requirements of carbide tools, and pressure lubrication insures trouble-free operation.

Convenience of operation has received a good deal of attention. Controls of the various elements are now generally grouped within easy reach of the operator and wherever possible are actuated by electric push-button or by hydraulic means. Where handwheels and levers must still remain, their location is studied from the point of view of the greatest convenience and the least fatigue for the operator. As in other countries, old prejudices of design are disappearing with the continuous arrival of new materials of construction and new ideas.

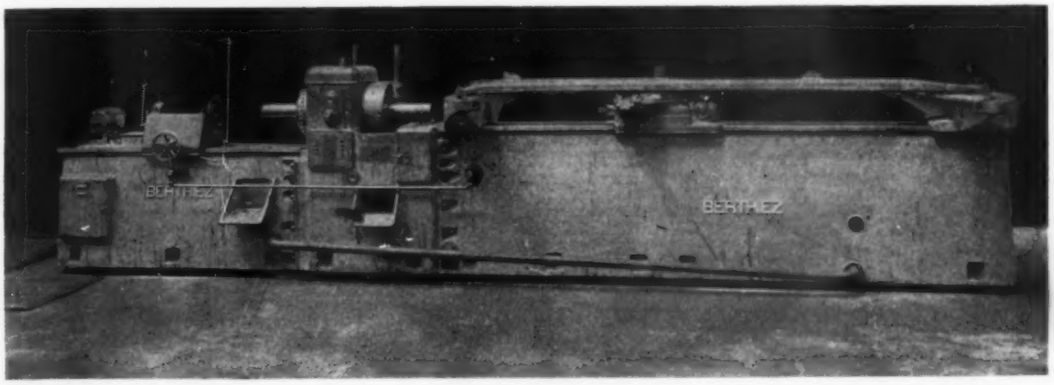


Cazeneuve builds precision lathes for high speeds and carbide tools. This one has a 275-mm. center height, 36 speeds from 8 to 1,000 r.p.m., 75 thread leads, 10-hp. flanged motor, automatic lubrication, alloy steel gears, alloy iron bed and nitrided spindle

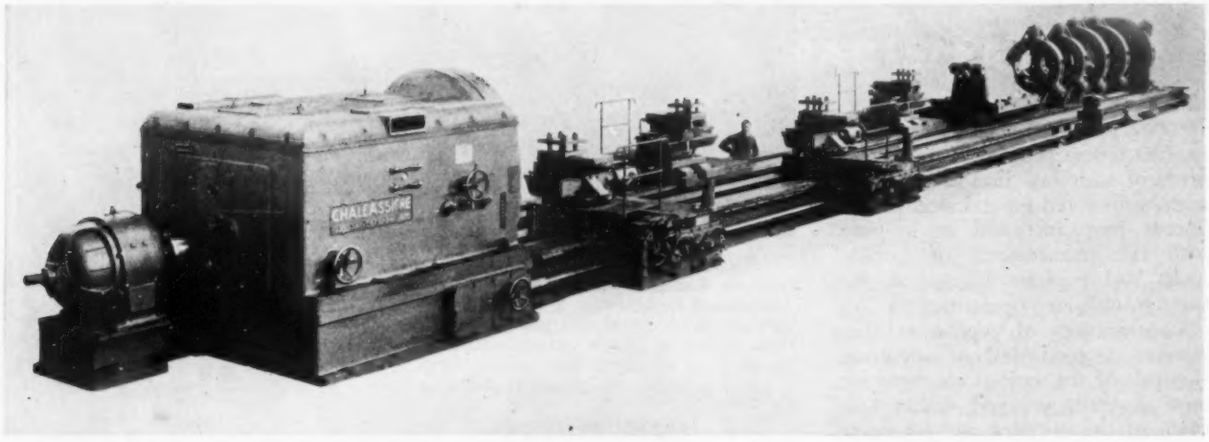


Fine feeds at high spindle speeds or coarse feeds at low spindle speeds are provided by a selector on the Somua lathe. Features are: 24 speeds from 8-1,600 r.p.m.; 18 metric, 18 English and 14 module pitches from the feed box; spindle start, brake, stop and reverse controlled from the apron

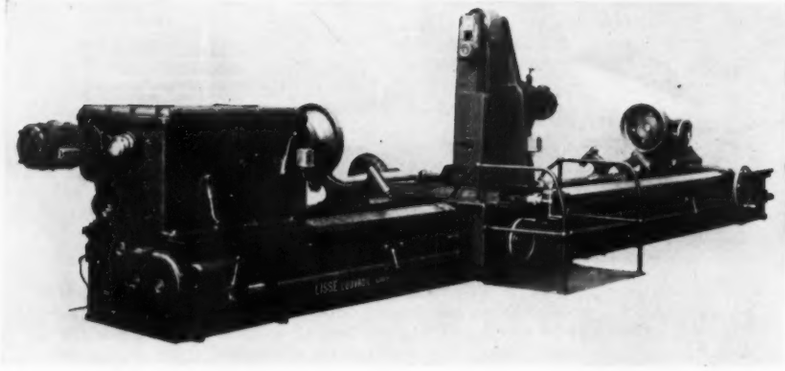
In a modern gun rifling machine by Charles Berthiez, the indexing, feed and ejection of chips are automatic



Controls and visual indicators are grouped on this Berthiez tandem gun boring lathe. Signal lamps facilitate verification of the efficiency and working condition of the machine

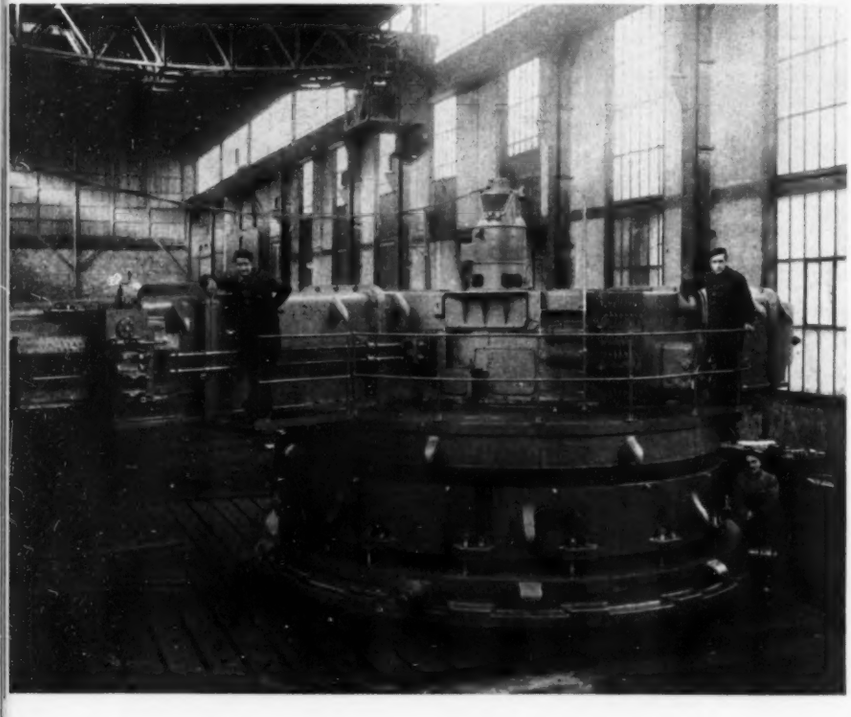


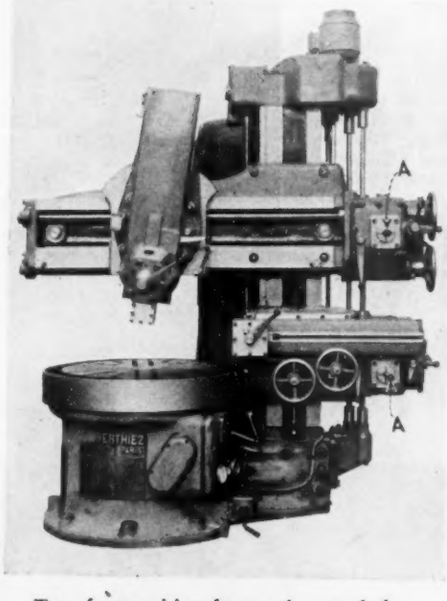
Four carriages each having sixteen independent feeds and rapid traverse of 10 ft. per min. are found in this lathe built by Societe Nouvelle des Usines de la Chaleassiere. Center height, 39 in.; distance between centers, 82 ft.; motor, 80 hp. at 600-1,300 r.p.m.



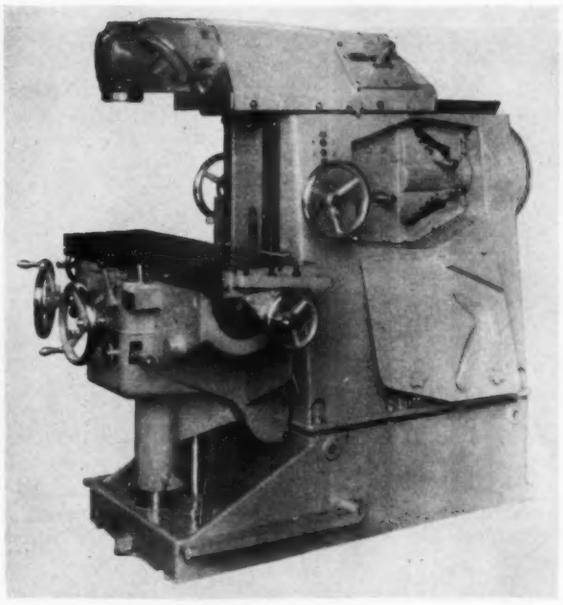
Gun barrels or practice torpedoes are polished by an abrasive belt running in the hollow column on the carriage of this Establissements Lisse machine. Time to polish a 24-in. tube, 20 ft. long is approximately 2 hr.

A special portable floor-type boring mill has been built by Societe Nouvelle des Usines de la Chaleassiere for bores of 52 ft. maximum and 18 ft. minimum. Each tool has 12 in. vertical travel, 40 in. longitudinal travel and eight automatic feeds. Height of machine is varied to suit the work by special adapters permitting rapid assembly and precision concentricity of the work

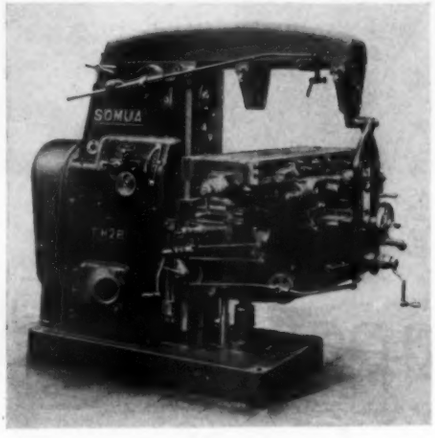




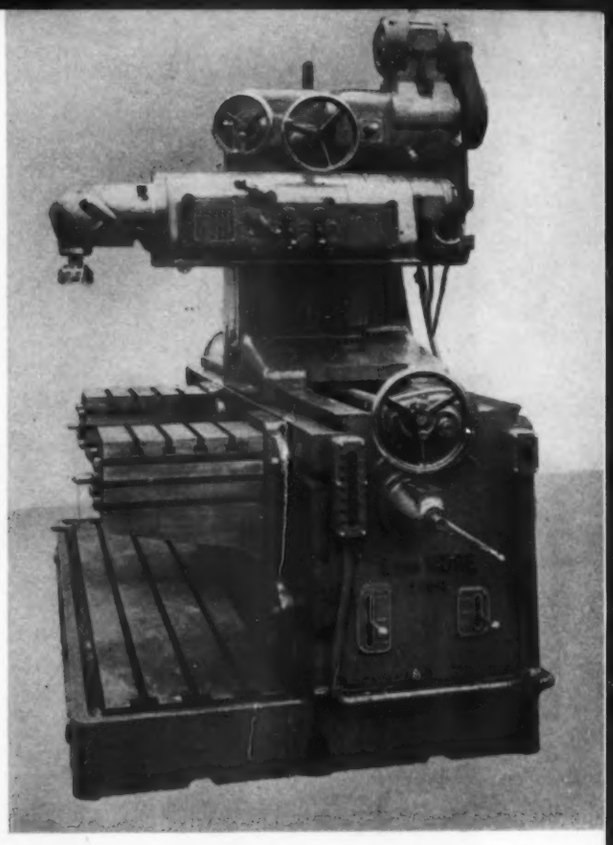
Two four-position levers *A* control the four directions of movement of the tools on this Berthiez boring mill. Visual indicators include an ammeter, tachometer, and signal lamps



No transverse table slide is provided on the "Super-universal" miller made by Leon Hure & Cie. A slide at top of column moves the head, which also rotates 180 deg. for angular cuts

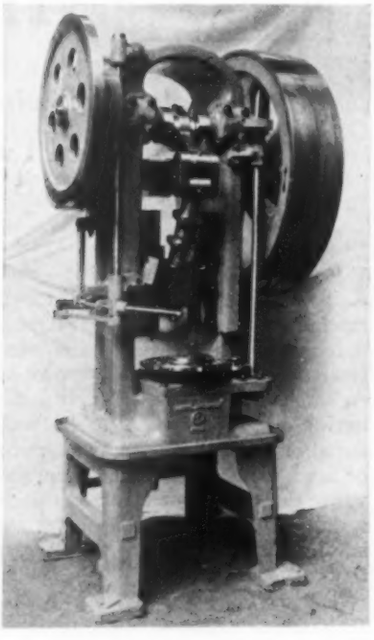


Somua builds this miller with sixteen fast and sixteen slow speeds that overlap to give 21 progressive speeds. The clutch lever, when displaced laterally, brings into play an hydraulic automatic speed selector which revolves a dial until the speed wanted comes into view

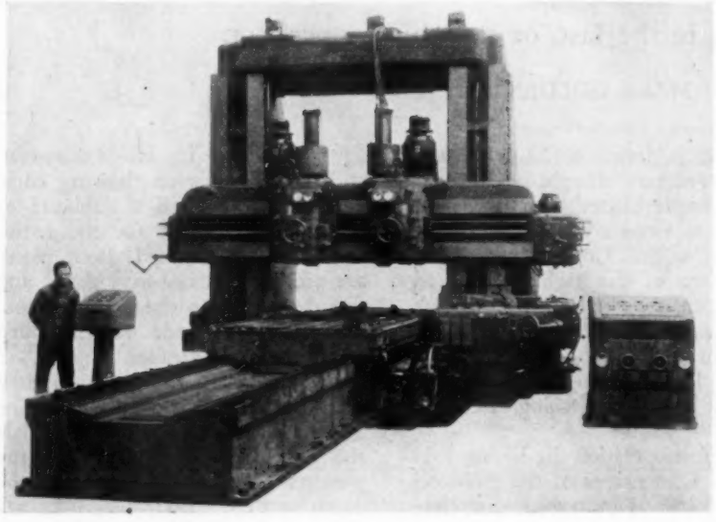


Hure applies the same sliding-head principle to a "lateral milling machine" which is suited to long narrow work. The job can be clamped on the knees, to the vertical surface of the bed or on the base

Two eccentrics of different throw, but, equal speed, are connected to the punch slide of this deep-drawing press built by the firm A. Hubert-M. Juy-J. Legros. Speed of the punch is reduced and is constant during the working cycle. Maximum pressure is applied to the work at the beginning of the drawing cycle, instead of being a minimum as in conventional presses



A control desk at the right contains the motor controls, visual gages and signal lights, while the one at the left houses only a duplicate set of motor controls. This Berthiez miller-planer has two milling heads on the cross rail and a planer head on the right upright



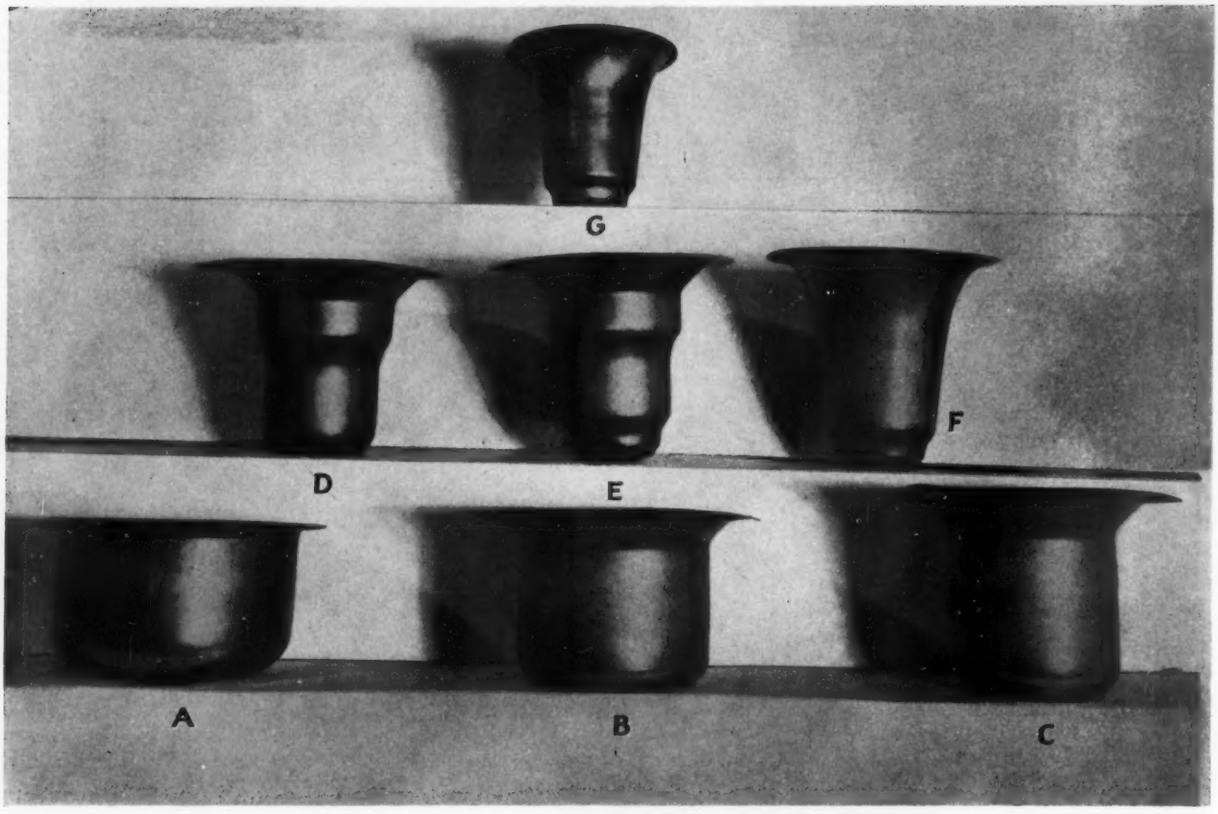


Fig. 1—Six press operations are required to produce a reflector for a table lamp from deep drawing steel

Deep Tapered Shells in Careful Steps

Unless preliminary draws are of the right diameter and depth, the shell will break in the last, or stretching, operation

MARK GOLDEN

IN A PREVIOUS article (*AM*—Vol. 81, page 1141) I described two tapered shells and the dies that produced them. These two shells were comparatively shallow and were made on single-action presses. When shells having great depth are to be produced, the double-action press must be used. This limitation also applies where the size of the blank and pressure required to prevent wrinkles are beyond the capacity of the single-action press.

The shell shown at *G*, Fig. 1, is a reflector for an indirect-lighting table lamp. It is drawn of 22-gage steel. While ordinary straight-sided shells are a simple matter to draw, shells such as this one are difficult because of the taper. Unless preliminary draws are of the right proportion and depth, the shell is sure to break at the last, or stretching, operation. Fig. 2 is an outline of the shell, the dotted line showing the shell as drawn before stretching to final shape.

The first-operation die is shown in Fig. 3. Dimensions of the tool-steel die ring are: 9¼ in. outside diameter; 1¼ in. thick; 5 in. inside diameter, and $\frac{3}{16}$-in. radius on drawing edge. The blank holder is a duplicate of the die ring except for the radius which is not required. Both pieces are press fits in cast-iron shoes, and they are also hardened and ground. The punch is made of cold-rolled steel and is threaded 1⅜ in.—8 threads, which is the usual standard thread for draw press work. The nosepiece shown in Fig. 5 with male and female threads is used with the punches on this work to get the depth of draw. Body length of the

nosepiece varies according to the depth of draw required. As a rule four holes are drilled in the nosepiece for tightening purposes.

The steel blank, which is $9\frac{1}{4}$ in. in diameter, is located on the die by three pins, one of which is shown in Fig. 3 alongside of the die ring. The blank holder is clamped to the ram of the press. This ram is actuated by cam action. Pressure on the blank is positively adjusted by four pairs of nuts on four threaded bars which pass through the ram. The punch is screwed onto the inside ram which has a $1\frac{3}{8}$ in. threaded male nosepiece for this purpose. This inside ram is operated by a crank as in an ordinary single-action press and is similarly adjusted for depth of draw. With the presure properly adjusted a perfect shell is produced. As shown as *A*, the shell is drawn to a depth of $2\frac{15}{16}$ in. in the first operation.

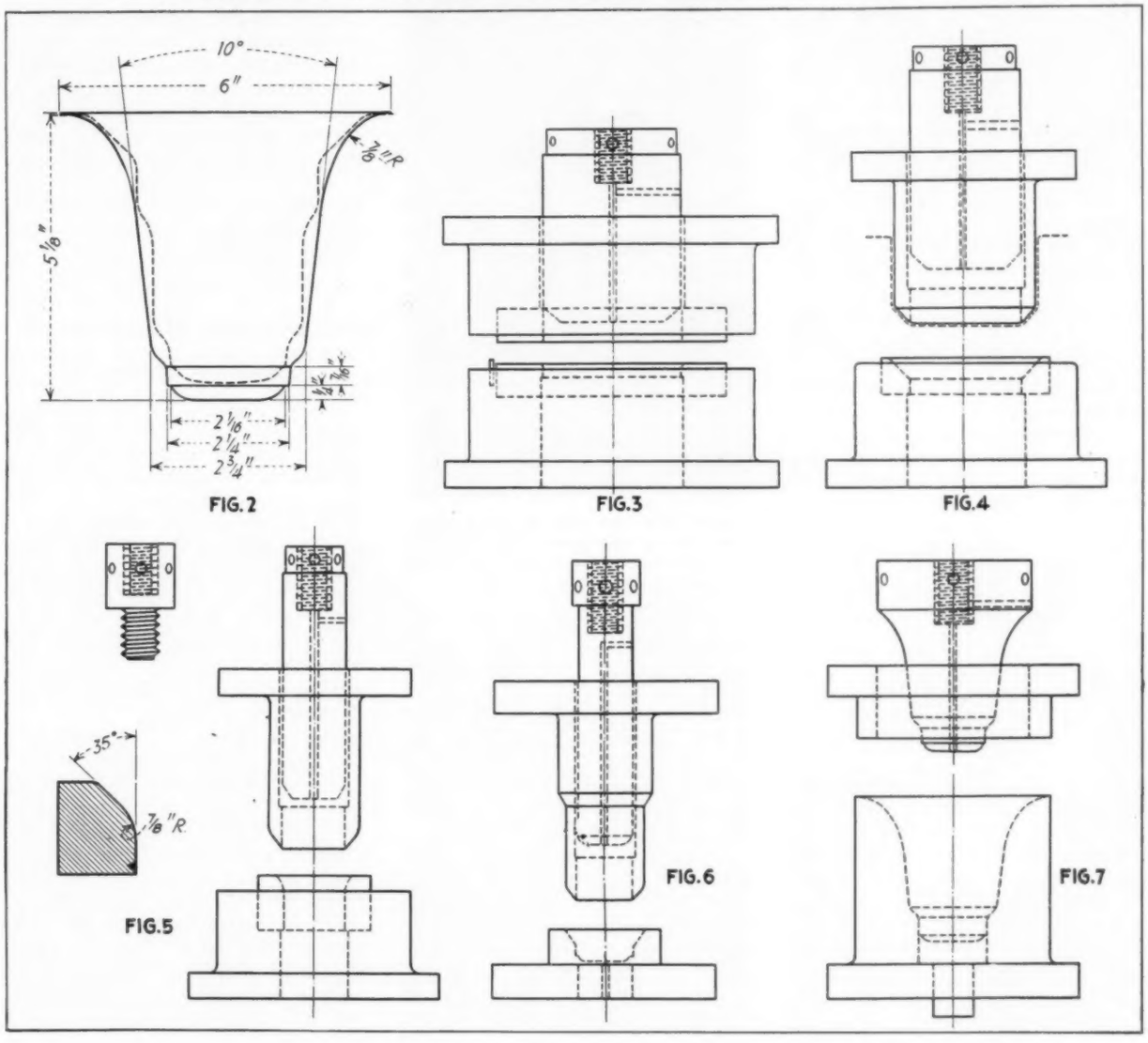
From this point on, until final forming, the shell is reduced in diameter and increased in length. The second-operation die is shown in Fig. 4. The die has an inside diameter of 4 in. As in the other dies in this set, the punch is smaller than the die by the thickness of the metal plus 0.005 in. The die ring has an angle of 45 deg., and the junction of the angle and the straight part of the die is brought to a radius of $\frac{3}{16}$ in. The blank holder has an outside diameter of 0.010 in. less than the inside of the first-operation shell and the angle on the blank holder is 45 deg. to match the die. Pressure is adjusted as in the first operation.

In putting the shells through this operation, the work is slipped up on the blank holder and is held in place by a slight pressure against the flange of the shell. The press is tripped and the blank holder comes down with the shell. While the shell is under pressure, the punch comes down and draws the shell to the reduced diameter. The shell now has a depth of $3\frac{3}{8}$ in. and is shown at *B*. Depth of draw is set so that the upper corner of the 45-deg. angle is brought right up to the flange left on the shell in the first operation.

The third operation is exactly the same as the second. In this operation the shell is reduced to $3\frac{5}{16}$ in. in diameter and 4 in. in depth. The 45-deg. angle, which will later form the bellmouth of the reflector, has now been developed to a length of $1\frac{1}{4}$ in. as at *C*.

The fourth operation is essen-

Fig. 2—The dotted line shows the shell before stretching to final shape. Figs. 3 to 7—After the first operation, the tools progressively reduce the shell's diameter and increase its length



tially the same as the second and third, except that the angle on die and blank holder is changed to 35 deg. and a larger radius is given the die at the junction point of the angle and the die opening. This radius is $\frac{7}{8}$ in. The reason for this change of angle and increased radius is to get a closer approach to the angle that will be later formed at this point in the shell. This die is shown in Fig. 5, and the resulting shell is shown at *D*. The shell at the lower end is reduced to $2\frac{3}{4}$ in. in diameter and is increased to $4\frac{5}{8}$ in. in depth.

The fifth operation is shown in Fig. 6. This die reduces the end of the shell to $2\frac{1}{4}$ in. in diameter and increases the total depth of the shell to 5 in. While the previous operations required the use of the knockout, this fifth operation does not require it as the depth of the draw is only $\frac{3}{8}$ in. After this operation the shell appears as at *E*.

The shell is now ready for the final forming or stretching operation. The die for this is shown in Fig. 7. As this die does not get much hard wear, the complete tool is made of cast iron except for the knockout which raises the finished shell from the die. The shell when completed in this operation is $5\frac{1}{8}$ in. deep and the flange is left large enough for the trimming operation.

It should be noted that the shell before being stretched must be an easy fit in the finishing die. If it has too much play the shell will break because of uneven stretching. The finished shell is shown at *F*, and is trimmed to $5\frac{1}{2}$ in. diameter. For trimming the shell is inverted. The punch is hollow to accommodate the shell and has its cutting edge slightly rounded to assist in starting the curl which is done on a trimming and beading lathe, with a roller of high-speed steel.

Great care is required in selection of steel for a shell of this type. Only good deep drawing stock can be used. Number 4 temper having about 50 Rockwell hardness has been found best in our practice, when drawing deep shells.

Recruits for Jap Munition Plants

WITH CONSCRIPTIONS continuing to deplete the ranks of able-bodied Japanese youths, and demand for machinery, automotive vehicles and munitions mounting as the China war grows in scope, Japanese industrialists are reporting a dangerous shortage not only of skilled workmen, but of unskilled labor as well.

Although trained machinists are exempt from military service at the front, the number of men available is said to be insufficient to meet the situation. Such measures as the government six-year program for the training of machinists are considered inadequate to fill the gap, inasmuch as new machinists are being turned out by this plan at too slow a rate.

In the wanted columns of Japanese papers, machinery, motorcar and other heavy industrial concerns have long ceased to seek "experienced men only," but are now glad to get men with "previous experience unnecessary." All kinds of inducements are made to persuade young country lads to become machinists. The governor of Fukuoka Prefecture, an important industrial district, recently distributed 720,000 hand bills and 20,000 posters in which a rosy picture is painted of the jobs in munitions plants.

On the other hand, operatives now employed in factories are obliged to work much overtime. To cite an instance, the average working-time for foremen in open-hearth plants has been stretched to 11 hr., 58 min. a day. In casting shops workers stay 11 hr., while the average record for lathe operators is 11 hr. 27 min., according to the Department of Commerce and Industry.

Country boys are told of good munitions jobs in this poster distributed by the governor of Fukuoka prefecture

As a result of fatigue and overexertion, accidents have been increasing at a fast rate. In a communique issued by the governor of Osaka Prefecture, the casualty rate is stated to have reached in the factories unhis jurisdiction the tremendous figure of 142.8 per 1,000 operatives, against 82.3 for chemical factories and 64.3 for foodstuff industries.

Earnings of skilled Japanese metal workers are second only to the incomes of high government officials, university professors and high-ranking army officers. In a survey conducted by the Metropolitan Police Board of Tokyo, 42,800 out of 76,000 workers were found to earn between 50 and 100 yen a month. This means that apprentices and unskilled workers in machinery industries have now advanced well within the income bracket of the salaried class. Among the skilled workers covered by this survey, 9,577 gave their earnings as between 100 and 150 yen, 2,227, between 150 and 200 yen, and 332, between 200 and 250 yen. More than 350 yen were recorded in a few cases.

Practical Pin Measurement

CHESTER H. FRANKLIN

Ira S. Williams (*AM*—Vol. 81, page 1042) points out that pin measurement of gears gives no indication of the concentricity of the pitch line and the bore. In this he is, of course, perfectly correct. However, in view of the fact that pin measurement is a commonly used method we can assume that most shops believe their work mandrels and the gear cutting machines to be true within commercial tolerances. Most gear shops do, however, check concentricity by rolling.

The possibility of eccentricity, however, leads to the suggestion that some of the mathematical contributors show us how to measure gears from the bore to pins located at different points around the gear. It would be easy to make a gage that fitted the hub bore and with a micrometer screw to contact the pins between the teeth. Such a gage should be useful on standard production and might avoid the necessity of rolling gears in some cases.

ROUND TABLE

Glorified Clerk?

"Why is Jim Taylor working so late, Al? He's still at his desk; seemed to be busy with some papers when I passed him on my way in." Ed stepped in Al's office after work for one of their frequent evening meetings.

"He must have let himself get in a jam on his reports, Ed. I'll ask him about it in the morning. He should be able to get his work done within a few minutes after the men leave."

"Reports? Don't tell me that you've given him a lot of paper work to do—when he should be out on the floor with his men. What's the grand idea?"

"Well, Ed, I'm holding each of the three foremen fully responsible for their individual sections and each is asked to report daily. So far, it has worked out fairly well. Each morning I have a picture of what happened during the preceding day."

"A picture! You mean you have a post-mortem. You don't have so much to do that you couldn't spend a lot of time out in the shop with your foremen, seeing for yourself how things stand. But, if you must have reports, why in tarnation are you asking the foremen to make them out? I've always felt that a foreman can get in his best licks out on the floor with his men, where his experience can be put to some use. Tell me this, of what value is the foreman's training to the shop if he's going to spend his time pushing a pencil?"

"Those men are doing a lot more than just fill in blank spaces on a form, Ed. I want each report analyzed so reasons can be given for anything that's out of line. Surely, shop experience is needed for that. Besides, we've a production clerk and a time study man to take care of the planning and scheduling of work. That gives the foreman more time for supervision and reports. Why, in most large shops today, all such things as rate setting, work routing and scheduling, inspection,

maintenance, even employment and training, are handled by specialists."

"By the time your shop is a little larger you'll decide that a kid, just out of high school, can make up the foreman's reports, at a third of the price you're paying a supervisor. Then it will be good-bye to experience—and the sheriff will have you."

"Nothing of the kind. Ed. Each of those foremen should be considered as a manager of a small jobbing shop; his reports are the same as a manager would make to his board of directors. The only way the foreman can know what is going on is to gather the material for his reports—that will put him out on the floor, as you want him, for a good part of the day. He'll know a lot more about what's going on in his place than he ever did in the old day."

"Yes, but he'll get there just after it's happened—not before, as he should."

Is it economical to make a clerk of the foreman? Where should the foreman spend his time?

DISCUSSION

Tell It All

Back in the good old days, when a man could lose or quit a job one day and get another the next, his main consideration was his pay envelope. He was not greatly concerned with the policies of the company and did not inquire about who owned the plant or how much they made per year. The dissatisfied workman could always move on to another job.

Within the last decade, things have taken a different turn. Jobs are not so plentiful, causing the worker to be somewhat worried about his future. Sometimes he feels that he is not getting his share of the profits, this feeling often being encouraged by outside influences.

Quite often a man may be heard to remark with dissatisfaction about the huge sums made by the employer. For this reason, a booklet explaining details of the company's plans and policies, together with a statement regarding its financial set up and operating expenses would go far to clear up many misconceptions. It may also be wise to inform the workers regarding policies the company adopts in its dealings with customers. The average man is not much interested in customer relations, but he is coming to realize that these policies directly affect his welfare and future.

A booklet of this type should be the means for clarifying those policies which deal directly with the man and which affect his well being. One of the most important points to be explained should be the methods of determining senior-

ity and how it directly affects the individual. Any printed material that helps the worker realize his important place in industry will be well-worth the effort and expense.

—ROBERT KNOTEK
Foreman, Die Department
Cleveland Division
Fisher Body Corporation

Distribution of pamphlets to employees is highly commendable. It frequently brings about a desirable harmony between workers and their superiors. Workmen are apt to be apprehensive about conferences held behind closed doors in which they have no active part.

By keeping employees in the dark, employers encourage whispering campaigns. Earnest workers want to be considered necessary to the firm and information about the company's activities are as important as the pay envelope in fostering good will. Uninformed employees often have the wrong impression about things that are going on in the plant and form their own opinions as to what is being discussed at meetings which are closed to them.—G. MCARDLE

Loyalty—An Asset

Loyalty to one's employer is not as common today, among the rank and file of shop workers, as it was years ago when shops were smaller and the employer and his workmen came in direct contact. It is rather hard for the average workman to feel any personal loyalty to a large corporation, which is usually dominated by men who, the employee thinks, know little about the manufacturing end of the business and still less about the workman's problems.

Certain plant executives, who come in direct contact with the men, will usually have a personal following of workers who are loyal to them. Walter Chrysler is a fine example of such a man. However, even Mr. Chrysler could not project his personality among all the thousands of production workers in his employ and secure their loyalty in the same manner as those who come in direct contact with him.

Workmen will develop a spirit of loyalty to some individual, rather than to a corporation. The small shop owner has a good chance to foster this spirit on the part of his men. Larger manufacturing plants have found it profitable to pick foremen and superintendents who can inspire this same spirit among the men in their departments.

—H. M. DARLING

Off to a Good Start

When a new process of new equipment is being placed in use, a specialist should work out the proper methods and should be in charge of all technical details relating to that particular activity until the men have been trained. The foreman can be given full charge when he has had sufficient experience with it to make supervision of the activity a routine operation. It is not advisable to place a specialist in complete charge over a foreman, however, since such a procedure reduces the foreman's authority over the men and gives the impression that the management does not have confidence in him. The specialist may be a failure as a foreman, his whole training is technical and does not cover the range of work that confronts the average departmental foreman.

—W. E. WARNER
Worthing, Sussex, England

The idea of engaging a specialist to start up a new group or job is a commendable one—with reservations, the chief of which would be the class of work and grade of skill necessary to carry it out. Where the line of demarcation between the old method and the new is not well defined and the workman, foreman and job have merged gradually, the same man can handle the new method on the old job. However, where a new line of departure has been struck, a new man with fresh ideas must be obtained for the new job.

The question concerning the control of the group is a sore point. Each shop foreman knows his men and their capabilities, but the specialist is handicapped by his inability to guide the men through a change. The real answer is cooperation, with the foreman maintaining supervisory control, particularly when changes are being made in production methods, and with the specialist acting only in an advisory capacity. The reaction is different with men as with mules when the reins have changed hands. —W. A. HARRIS
Coventry, Warwickshire, England

Where There's Smoke

Where smoking in the shop is prohibited, the lavatories and casting yards are always busy places. It is one of the failings of human nature to desire something that is withheld. I doubt very much that the smoking rooms suggested by Al would solve this problem. The men will not like being on view while they indulge in a smoke.

Workmen rarely leave their machines and benches in shops where smoking is permitted. One serious drawback, however, to unrestricted smoking, especially of cigarettes, is that freedom often causes some workman to develop into "chain" smokers which, in time, seriously undermines their health.

One of the best ways of tackling this problem, I believe, is to specify definite times for smoking in the morning and afternoon. This plan has worked admirably in one shop, permitting the men to have their smoke and keeping in check any over-indulgence. —R. G. HEWITT
Huddersfield, England

Lack of restrictions on smoking in the old type machine shops followed later by its total prohibtion in the more modern shops created, in the minds of some of the confirmed addicts, a keen sense of frustration. Since then they have made the most of every opportunity to take a few hidden puffs at a pipe or cigarette.

Many managements have shut their eyes to this practice, probably because some of the managers are equally guilty. Regulations that cannot be enforced are better cancelled. Others should be substituted that are more readily enforced.

The solution probably is a compromise where the smoker is allowed to enjoy his pipe during specified times in the morning and afternoon. Such a concession, which is now made in many offices and shops, is appreciated and seldom abused. The smoker knows he can look forward to half an hour of indulgence, morning and afternoon, instead of having to find a safe retreat where he can have a quiet smoke in defiance of rules. —W. L. WATERHOUSE
Horfield, Bristol, England

Mixed Lighting

A new lighting installation in the Gould & Eberhardt shop is a happy combination of mazda and new lamps of the mercury type. By alternating these lamps they secure most of the good points of both systems and neutralize the ghostly (some spell it 'ghastly') appearance due to the mercury lamp. This combination of lamps, together with ceilings that reflect a large amount of light, give a light condition in the shop that old-timers never even dreamed of.

IDEAS FROM PRACTICAL MEN

Indexing Drill Jig

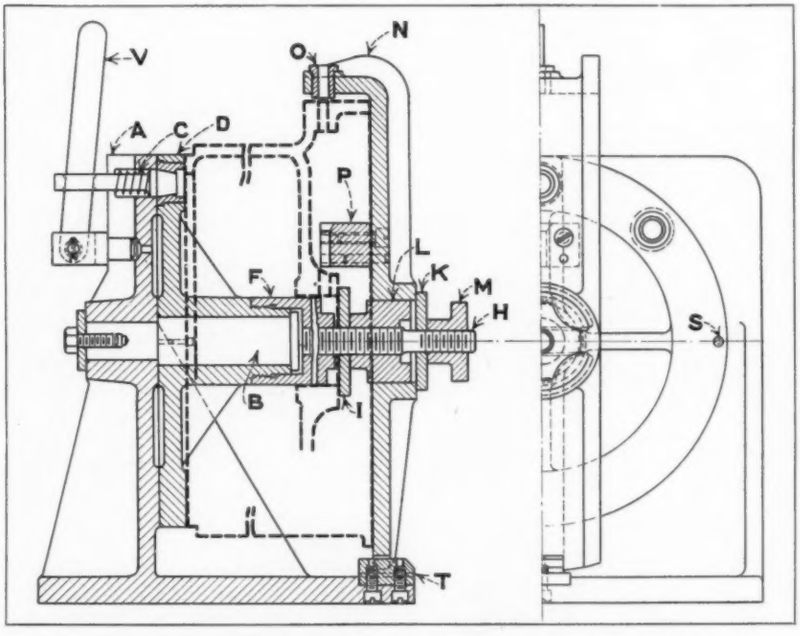
WILLIAM B. GREENER

We were having trouble in drilling two holes at an angle of 45 deg. to each other in the hubs of crankcases for airplane motors. To reach the hubs, holes had to be drilled through the flanges of the crankcases, requiring a long drill unsupported at the point. Runout and frequent breakage of the drills gave us considerable grief. To overcome the trouble, the writer designed the jig ilustrated, of which the essential parts are:

The body *A* into which is fitted the hardened and ground stud *B;* the spring-actuated index pin *C;* the plate *D;* the sleeve *F* screwed on the hub of the index plate; the stud *H* screwed into the sleeve; the C-washers *I* and *K;* the hand nuts *L* and *M;* the aluminum bushing plate *N* containing the bushing *O* and the drill guide *P;* the locating pins *S;* the locating block *T*; and the lever *V* for operating the index pin.

In operation, with the index pin in one of the bushed holes in the index plate, the work is put in the jig, the sleeve *F* engaging the bore of the hub and the locating pins *S* in the index plate engaging holes previously drilled in the work. The C-washer *I* is placed in position and is locked by tightening the hand nut *L*. The bushing plate is slid over hand nut *L*, a slot engaging the locating block *T*. The C-washer *K* is then placed over stud *H*. Tightening hand nut *M* completes the assembly.

After a hole is drilled in the flange, the drill being guided by bushing *O*, the drill is lowered and is guided by a hole in the guide block *P* for drilling the hub. After the first hole has been drilled in the hub, the drill is withdrawn to clear bushing *O*. The bushing plate is released by backing off hand nut *M* and the index pin is withdrawn by lever *V*. The work is then indexed for the next hole by turning it and the index plate until the index pin snaps into the next hole in the index plate. The hand nut is then tightened and drilling the next hole can proceed.



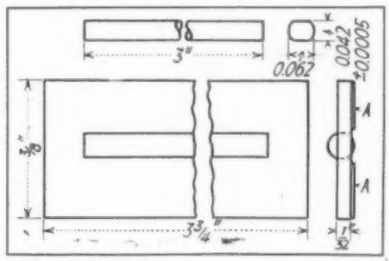
To prevent runout and breakage of the long drill required to reach the hub, a drill guide is attached to the bushing plate near its hub

Grinding Slender Work

CHARLES WESLOW

We had six pieces of drill rod 0.062 in. in diameter and 3 in. long to have equal and diametrically opposite flats ground on them, the thickness between the flats being 0.042 in. plus or minus 0.0005 in. as shown in the illustration.

To make a fixture for holding the work on the magnetic chuck, a slot was cut with a saw 0.062 in. thick



Two strips of newspaper were put under the sides of the fixture to partly insulate it so that the magnetic pull would be greatest on the work

on a piece of B.&S. ground tool steel $3\frac{3}{4} \times \frac{3}{8} \times \frac{1}{32}$ in. and the metal on the sides of the slot was peened so that the work fit snugly in it, but loose enough for the magnetic pull to keep the work in contact with the surface of the chuck. In placing the assembly on the chuck, two strips of newspaper *A* were put under the fixture on each side of the slot but not under the work, the idea being to partly insulate the fixture so that the magnetic pull would be greatest on the work and insure its contact with the surface of the chuck.

When 0.005 in. had been ground from one side of the work, the fixture was turned so that the side of the work just ground would be in contact with the surface of the chuck, and so on until the grinding was finished. The two pieces of

newspaper under the fixture made it easy to slide off the assembly from the chuck for measuring the work. Each time the assembly was replaced on the chuck, the work would slide down in the slot until its bottom was in contact with the surface of the chuck, leaving its top projecting above the fixture. After the work was finished ground it was found to be slightly sprung and had to be straightened.

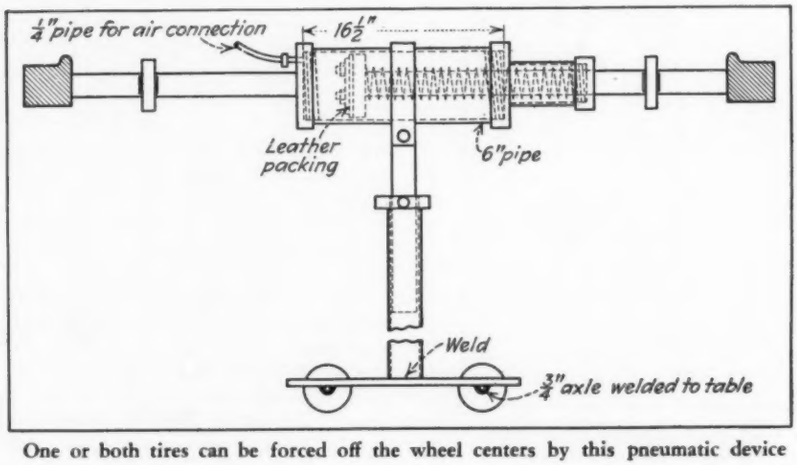
Pneumatic Tire Remover for Railway Shops

FRANK C. HUDSON

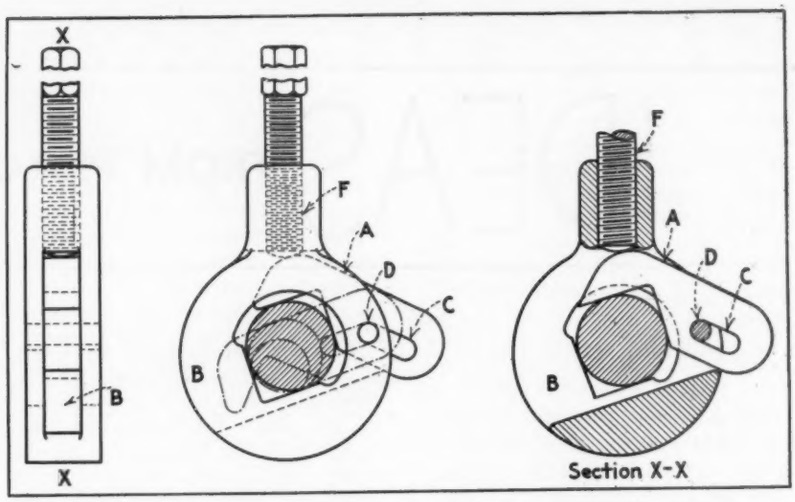
It usually takes some coaxing or persuasion to remove tires from wheel centers, even after they have been heated in the usual manner. Many use a sledge hammer to start the tire and to work it loose but this is not considered good practice. To avoid this the Chesapeake & Ohio Railway has adopted the pneumatic tire remover shown. A 20-in. square base of $\frac{1}{2}$ in. steel plate has four recesses cut for wheels which are $3\frac{3}{4}$ in. in diameter and $\frac{3}{4}$ in. thick. Axles of $\frac{3}{4}$ in. round steel are welded to the plate and have $\frac{1}{32}$ in. clearance in the wheels.

In the center of the plate is welded a pipe large enough to receive the 2-in. inner pipe that acts as a support for the air cylinder above. This cylinder has a bore of 6 in. for the leather-packed piston on the end of the ram. A band surrounding the cylinder gives a somewhat flexible connection between cylinder and the adjustable column.

With the portable tire remover positioned between the wheels so as to bear against both tires, air is admitted to the cylinder and one or both tires are forced off, as desired. The device has proved very satisfactory in every way.



One or both tires can be forced off the wheel centers by this pneumatic device



A clot in the clamp engaged by a pin in the body permits the clamp to automatically adjust itself on the work as it is being tightened

Dog for the Grinder

J. R. WHITTLES

Illustrated is a dog for the cylindrical grinder that is adjustable for work from $\frac{1}{2}$ to $1\frac{1}{4}$ in. in diameter. The work opening in the body is V-shaped at the bottom and the clamp *A* has a corresponding V-notch in the under side and is free to move in the slot *B* in the body of the device.

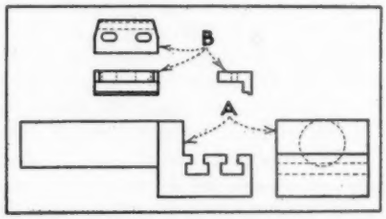
The rear end of the clamp has a slot at *C* in which the pin *D* engages, acting as a pivot. The clamp is free to slide on pin *D* so that both the angular sides of the V-notch will automatically bear on the work as the clamp is being tightened by the screw *F*. The upper part of the screw is hexagon in shape so that a wrench can be used on it, and also for a good grip of the hand in making quick adjustments.

The circles in dotted lines in the middle view represent the range of diameters that can be held. The dog is rotated by a drive pin in the faceplate of the grinder contacting the upper part of the tightening screw.

Blade and Toolbit Holder

GAYLORD G. THOMPSON

The illustration shows a holder for either blades or toolbits that has proved to be very useful, especially in automatic and hand screw machines and turret lathes. The unit consists of the holder *A* having a shank machined to fit the tool spindle of a screw machine or the turret of a turret lathe; the tool clamp *B*; and the necessary screws and nuts.



The screw holes in the clamp are so spaced that tools can be clamped either across or parallel with the T-slots in the holder

The holes in clamp *B* are so spaced as to permit clamping tools either across the T-slots or parallel with them. The surface of the T-slot section of the holder must be below the center line the same distance as the height of the tool used, so as to have the cutting edge on the center line. It is an easy matter to add shims to raise a tool that is too low.

One or more tools can be clamped in position in the holder for facing, face grooving, radius cutting, cham-

fering, forming and many other combinations necessary for operations peculiar to certain parts.

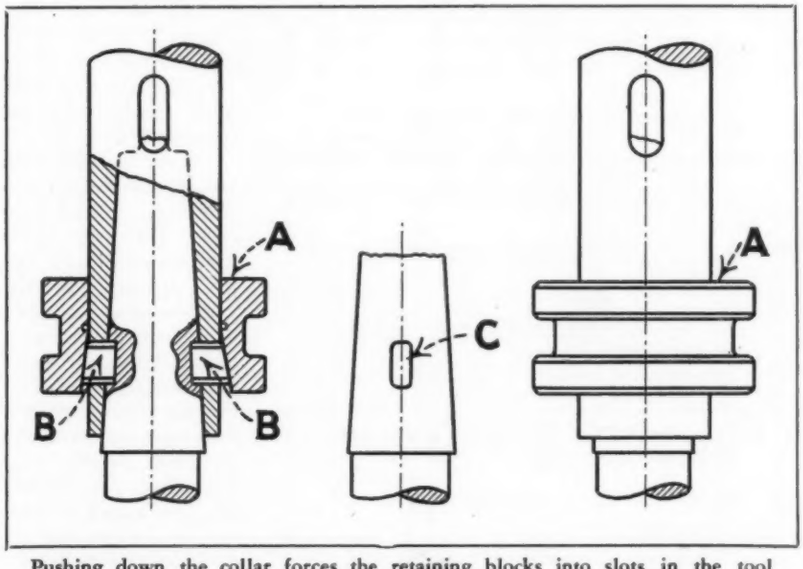
Holding Counterbores and Tangless Drills

R. G. HEWITT
Huddersfield, Yorkshire, England

In the illustration is shown a device for holding drills having broken driving tangs, also back counterbores. There are no projecting screws and a further advantage is the ease by which the device can be brought into action or removed from the drill spindle when not required.

The upper part of collar *A* is bored for a sliding fit on the drill spindle, while the lower part is bored taper to suit the taper on the outer ends of the retaining blocks *B* which pass through slots in the spindle and engage corresponding slots *C* in opposite sides of the taper shank of the tool.

In operation, the shank of the tool is placed in the spindle, taking care that the slots in both members are in alignment. Collar *A* is put on the spindle and is pushed above the slots, and the two retaining blocks *B* are entered into the spindle slots and are pushed through into slots *C* in the shank of the tool. The collar is then pushed down over the retaining blocks, its taper bore forcing them inward. A few taps on the collar with a hammer will wedge the shank of the tool securely in the spindle. On releasing the collar from the retaining blocks, both it and the blocks can be removed by hand and the tool can be taken out.



Pushing down the collar forces the retaining blocks into slots in the tool shank, holding it securely and insuring that the tool will be positively driven

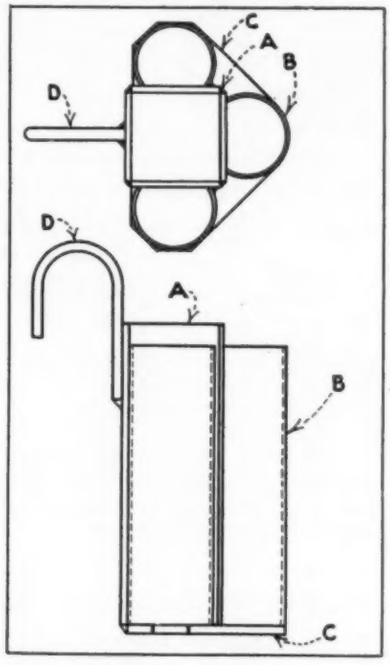
Holder for Welding Rods

JOHN E. HYLER

There is shown in the illustration a welding-rod holder that is especially useful where structures of considerable size are being welded. It can be hung up at any convenient point and moved from place to place as welding proceeds. In addition, it has four pockets for holding as many types of rods, three of the pockets being made of pipe.

The main body *A* of the holder is made of four pieces of plate set edge to edge, thus permitting a generous fillet to be made in each corner. On three of its four sides, pieces of 3-in. pipe *B* flattened on one side are welded, the pipes being somewhat shorter than the height of the holder so that welding rods can be easily placed in them. The main body of the holder is 4 in. square and 1 ft. high.

A piece *C* that will entirely cover the bottoms of the holder and the pipe pockets is cut from light plate and is welded in place. The hook *D* is fashioned from a piece of rod and is welded to the body in the position shown. The size and the shape of the hook may vary, depending upon what seems most suitable for use in the particular place the holder is to be used.

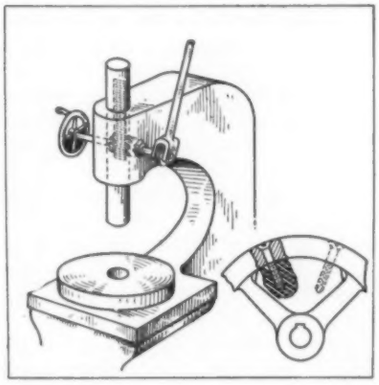


This welding-rod holder has pockets for four different types of rods. It also has a hook by which it can be hung at convenient points

Counterbalancing an Arbor Press Ram

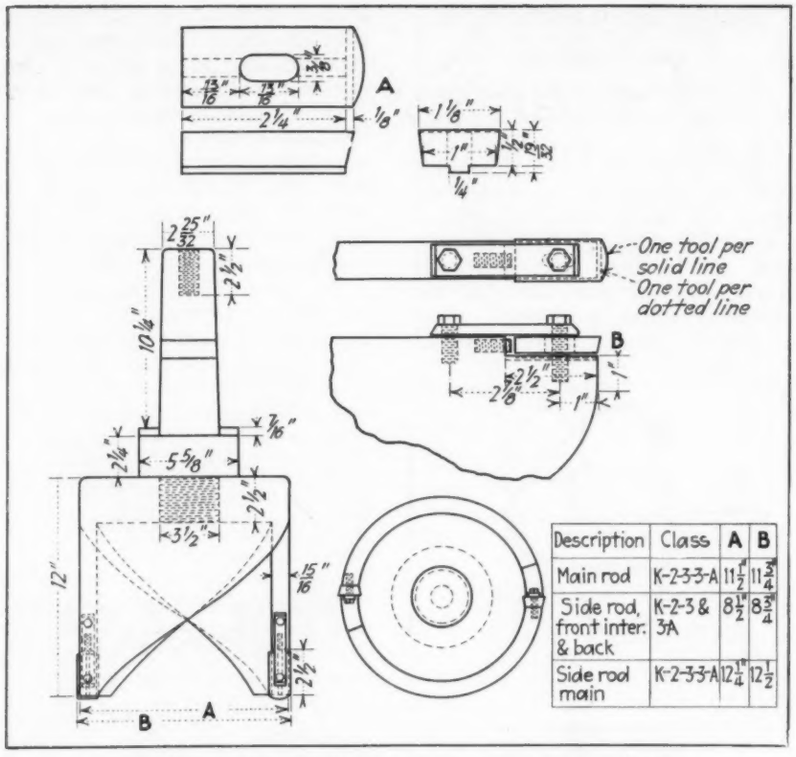
PAUL C. BRUHL

On an arbor press of the conventional type it was found that when the ram was up, and even when the operating lever was back as far as it would go, the ram would fall because of its unbalanced weight, the pawl not being in position on the ratchet to check its descent, and would sometimes pinch the operator's fingers.



Lead weights fitted between some of the spokes of the handwheel and fastened to rim, ovrbalanced it and counterbalanced the ram through the pinion

This condition was remedied by fitting lead weights between some of the spokes of the handwheel, as shown by the black areas. The weights were attached to the rim of the handwheel by screws, as shown in the view at the right, overbalancing it enough to counterbalance the weight of the ram through the pinion. This simple alteration removed the source of much annoyance.


A
B
One tool per solid line
One tool per dotted line
Description | Class | A | B
Main rod | K-2-3-3-A | 11½ | 11¾
Side rod, front inter. & back | K-2-3 & 3A | 8½ | 8¾
Side rod main | K-2-3-3-A | 12¼ | 12½

Each cutter has an adjusting screw, to set the round-end cutter with any desired lead over the square cutter

Trepanning Tool for Connecting Rods

HERBERT CRAWFORD

While the use of the cutting torch, or lance, is being used to a considerable extent for cutting out the holes in connecting rod ends, as well as for shaping the outside, the trepanning tool is still the favorite method in some shops.

One of the problems in cutting holes in this way is the proper design of both the body and the tools used. The tools must be rigidly supported, and at the same time, the body must be cut away enough to provide sufficient chip room for the depth cut. The device shown was developed by the Chesapeake & Ohio Railway Company.

Details of the construction are illustrated above. The bodies vary from 8½ to 12¼ in. outside diameter in this case, the wall thickness of $\frac{15}{16}$ in. being maintained in all sizes. The width of tools used gives $\frac{3}{16}$ in. total clearance.

One cutter has a rounded nose, or cutting edge, while the second cutter is square across the front as at *A*. Side clearance is shown in the details of the cutter. The method of clamping and adjusting is also shown at *B*. The clamp is long and is held by two cap screws, one going through a slotted hole in the cutter. Behind the cutter is an adjusting screw. This tool is the result of long experience with this kind of boring.

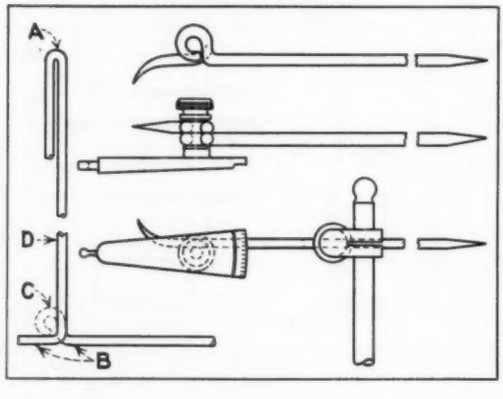
Attaching an Indicator to the Surface Gage

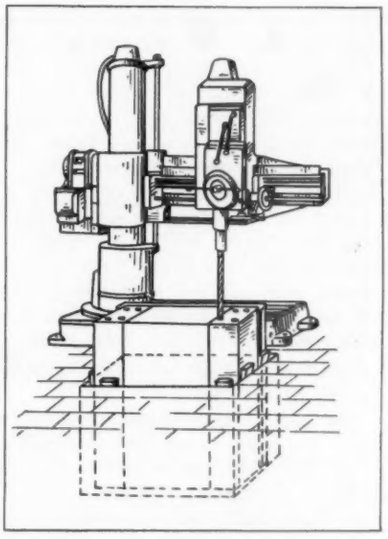
THEODORE KRUGER

In the illustration is shown a simple method of attaching an Ideal indicator to the scriber of the surface gage. The scriber of my surface gage is $\frac{5}{32}$-in. drill rod and the whole rig is so light that the indicator can extend as much as 7 in. from the spindle of the gage without upsetting the base.

The drill rod for the scriber is heated and then bent as at *A* and again as at *B*. The eye *C* is formed by bending the part *D* around a pin. The stud at the back of the indicator is put through the eye *C* and is locked by a knurled thumbnut.

This arrangement makes the gage doubly useful. The indicator can extend as much as 7 in. from the spindle of the gage without upsetting the base





The work is lowered by the crane into a concrete-lined pit beside the radial drill and is blocked up and wedged into drilling position

Drilling the Ends of Long Work

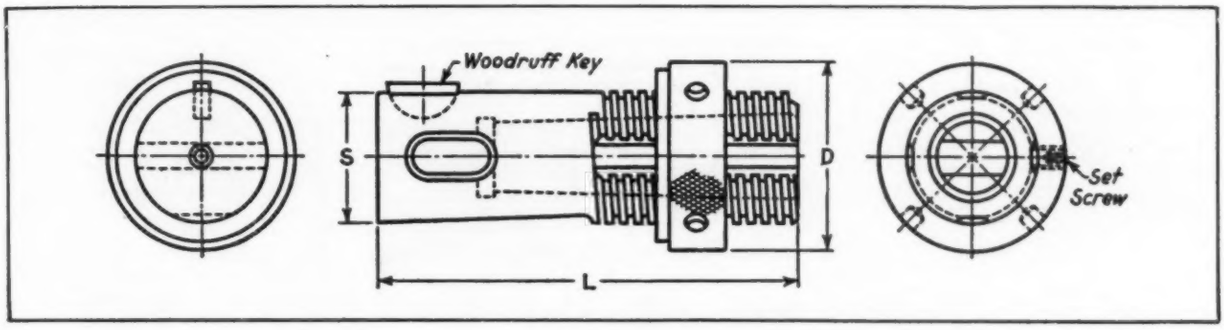
K. ENGLISH
English Company

We frequently have to drill holes in the ends of heavy machine bases that are too long to go under the arm of our radial drill. We had been doing the drilling in a horizontal boring machine, but the machine was often tied up with other work and the bases had to wait.

Finally we dug a pit beside the radial drill and lined it with concrete. Now the bases are lowered into the pit, end up, by the crane and are blocked up so that their ends project enough above the floor to be reached by the drill without lowering the arm to the limit. As shown by the illustration. They are then locked in position by wedges and are drilled to layout lines.

AMERICAN MACHINIST *Reference Book Sheet*

Adapters for Multiple-Spindle Drill Heads



THE AMERICAN STANDARDS ASSOCIATION has approved standard ASA B5-11 on "Adjustable Adapters for Multiple-Spindle Drilling Heads." Sponsor organizations are the Society of Automotive Engineers, the National Machine Tool Builders Association and the American Society of Mechanical Engineers.

The purpose of these adapters is to secure vertical adjustment for taper shank tools when used in multiple-spindle drilling heads. Standardization in this field is considered likely to effect a considerable saving through permitting the transfer of spindles from old heads to heads of new design or the retention of such spindles in stock for repair purposes. Detail dimensions of the adapter body are given in Table 2 on the following page.

Table 1 General Dimensions of Assembly

Size S	ASA Taper Number	Woodruff Key Size	Set Screw Size	Adapter Length L	Diameter of Nut D
3/4	1	5/32 × 5/8	5/16–18 × 5/16	3	1 1/4
1 1/16	1	3/16 × 7/8	5/16–18 × 5/16	3 5/8	1 9/16
1 1/16	2	3/16 × 7/8	5/16–18 × 5/16	3 5/8	1 9/16
1 3/8	2	1/4 × 1	5/16–18 × 5/16	4 5/8	1 7/8
1 3/8	3	1/4 × 1	5/16–18 × 5/16	4 5/8	1 7/8
1 7/8	3	5/16 × 1 1/4	5/16–18 × 7/16	5 5/8	2 5/8
1 7/8	4	5/16 × 1 1/4	5/16–18 × 7/16	5 5/8	2 5/8

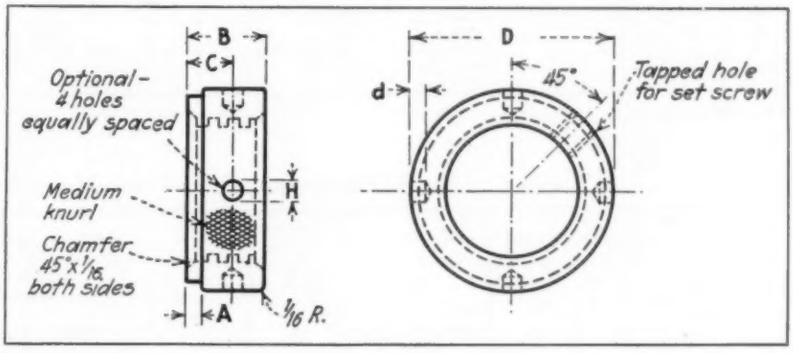


Table 3 General Dimensions for Adjustable Adapter Nuts

Size	Diameter of Nut D	Thickness B	C	A	Set Screw Hole Size S	Set Screw Hole Pitch Diameter Max	Set Screw Hole Pitch Diameter Min	Holes for Spanner Holes Diam H	Holes for Spanner Holes Depth d	Internal Acme Thread Minor Diameter Max	Internal Acme Thread Minor Diameter Min	Internal Acme Thread Major Diam Min	Threads per Inch
3/4	1 1/4	1/2	1/4	1/32	5/16–18	0.2805	0.2764	1/4	1/8	0.670	0.667	0.751	12
1 1/16	1 9/16	1/2	1/4	1/16	5/16–18	0.2805	0.2764	1/4	1/8	0.982	0.979	1.063	12
1 3/8	1 7/8	1/2	1/4	1/16	5/16–18	0.2805	0.2764	1/4	1/8	1.294	1.291	1.376	12
1 7/8	2 5/8	3/4	3/8	3/32	5/16–18	0.2805	0.2764	1/4	3/16	1.795	1.792	1.876	12

All dimensions given in inches at 68 F.

MATERIAL. Chromium-nickel steel, S.A.E. 3120. or equivalent case hardened.

FINISH. All surfaces must be finished.

MARKING AND MANUFACTURE. Thread size, manufacturer's name, or trademark, and A.S.A. taper number should be placed on end. All burrs must be removed.

TOLERANCES. Tolerances on fractional dimensions are plus or minus 0.010 in. unless otherwise specified.

SCREW THREAD ANGLE. The side of the acme screw thread shall make an angle of 14½ deg with a line perpendicular to thread axis.

AMERICAN MACHINIST *Reference Book Sheet*

Adapters for Multiple-Spindle Drill Heads

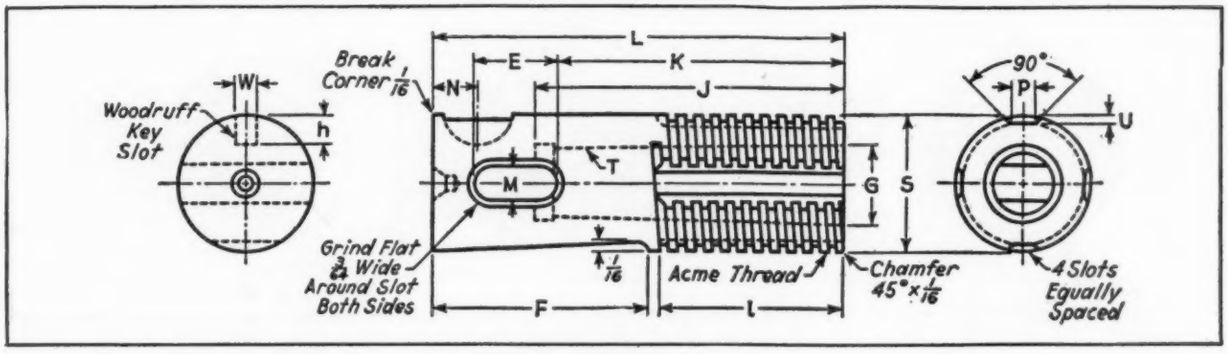


Table 2 Detail Dimensions for Adjustable Adapter Body

Size	Length of Adapter	Diameter of Body and Major Diameter of External Acme Thread		Minor Diameter External Acme Thread	Threads per Inch	Length of Thread	Length of Flat	ASA Taper No.	Machine Taper			
									Diameter of Taper Large End G		Slope of Taper	Length of Taper Socket
	L	Max	Min	Max			F		Max	Min	T	J
3/4	3	0.7500	0.7497	0.6566	12	1 1/2	1 1/2	1	0.477	0.475	0.600	2 3/16
1 1/16	3 5/8	1.0625	1.0622	0.9691	12	1 5/8	1 7/8	1	0.477	0.475	0.600	2 3/16
1 1/16	3 5/8	1.0625	1.0622	0.9691	12	1 5/8	1 7/8	2	0.702	0.700	0.600	2 5/8
1 3/8	4 5/8	1.3750	1.3747	1.2816	12	1 7/8	2 5/8	2	0.702	0.700	0.600	2 5/8
1 3/8	4 5/8	1.3750	1.3747	1.2816	12	1 7/8	2 5/8	3	0.940	0.938	0.602	3 1/4
1 7/8	5 5/8	1.8750	1.8747	1.7816	12	2 1/2	3	3	0.940	0.938	0.602	3 1/4
1 7/8	5 5/8	1.8750	1.8747	1.7816	12	2 1/2	3	4	1.233	1.231	0.623	4 1/8

All dimensions given in inches at 68 F.

Table 2 Detail Dimensions for Adjustable Adapter Body (Cont.)

Size	Distance End of Body to Keyway	Length of Drive Slot	Width of Drive Slot M		Distance End of Body to Center of Key	Woodruff Key Slot					Longitudinal Set Screw Slots	
						Nominal Size	Width W		Depth h		Width	Depth
	K	E	Max	Min	N		Max	Min	Max	Min	P	U
3/4	2 1/16	3/4	0.223	0.219	1/2	5/32 × 5/8	0.1568	0.1553	0.1719	0.1669	1/4	5/64
1 1/16	2 1/16	3/4	0.223	0.219	5/8	3/16 × 7/8	0.1880	0.1863	0.2813	0.2763	1/4	5/64
1 1/16	2 1/2	7/8	0.270	0.266	5/8	3/16 × 7/8	0.1880	0.1863	0.2813	0.2763	1/4	5/64
1 3/8	2 1/2	7/8	0.270	0.266	3/4	1/4 × 1	0.2505	0.2487	0.3130	0.3080	1/4	5/64
1 3/8	3 1/16	1 1/16	0.334	0.328	3/4	1/4 × 1	0.2505	0.2487	0,3130	0.3080	1/4	5/64
1 7/8	3 1/16	1 1/16	0.334	0.328	15/16	5/16 × 1 1/4	0.3130	0.3111	0.3908	0.3858	1/4	5/64
1 7/8	3 7/8	1 1/4	0.490	0.484	15/16	5/16 × 1 1/4	0.3130	0.3111	0.3908	0.3858	1/4	5/64

All dimensions given in inches at 68 F.

CENTERS. Shank end, internal center required.

CONCENTRICITY OF HOLE-G. Hole must run true with outside within 0.001 indicator reading.

CONCENTRICITY OF DRIVING SLOT-M. 0.219 to 0.270 inclusive = 0.006 indicator reading, 0.328 to 0.490 inclusive = 0.007 indicator reading.

MATERIAL. Chromium-nickel steel, S.A.E. 3120, or equivalent, case hardened.

ROCKWELL Hardness C-50 to C-54.

FINISH. External Diameter, major diameter of thread and internal diameter of tapered Hole G must be ground, it being understood that finished surfaces must be acceptable to user.

MARKING. Thread size, manufacturer's name, or trademark, and A.S.A. taper number to be marked on end.

MANUFACTURE. All burrs must be removed and thread must be polished. Tolerances on fractional dimensions are plus or minus 0.010 unless otherwise specified.

SCREW THREAD ANGLE. The side of the acme screw thread shall make an angle of 14 1/2 deg with a line perpendicular to the axis of the thread.

INDUSTRIAL REVIEW

ONLY A MIRACLE will serve to make of the first quarter of 1938 a period of even reasonably good business. This opinion is based on statements of distributors and builders of machinery and machine tools from all of the important industrial centers of the country. Builders have still appreciable backlogs to keep their employees busy and they are also getting substantial orders from abroad, but domestic business is decidedly flat. Some few expect that the second quarter will see a considerable revival in domestic orders but with others this is only a hope.

IN NEW ENGLAND there is a fair amount of inquiry for new machines but closing of orders is proceeding very slowly. Definite improvement is looked for in the second quarter. New York also reports a certain amount of inquiry but practically nothing in the way of orders. Philadelphia feels that the political situation is going to prevent any immediate recovery in the placing of domestic business. Opinions differ in Pittsburgh. Some believe that machine tool sales during the first quarter will be very small. Others that they will be appreciably better than for the last quarter of 1937.

CONSENSUS of opinion in Cleveland is that present low ebb will be maintained throughout the first quarter and possibly longer. Detroit is still hopeful that there will be an upturn before the middle of the quarter is reached. This hope is likely to be realized if certain tooling programs are released. Cincinnati reports very little domestic business for the last month and no sign of improvement until the later part of January. There is a hope that there will be a real improvement then. Foreign business booked by machine tool builders has been appreciable.

DECEMBER was a bad month in St. Louis partly because of ill-feeling generated by the labor trouble at the Ford assembly plant. The Labor Board inquiry is not helping the situation. Not much is expected of the first quarter but there is a feeling that the tendency will be upward toward the end of that period. Even Chicago, up till now the brightest spot in the domestic picture, is feeling the impact of the recession. Inquiries are not at all satisfactory and orders are even less so. The downward tendency continues in Milwaukee and is resulting in layoffs here and there. At this moment there is nothing to indicate that there will be an improvement during the next three months.

ON THE WEST COAST machinists are hunting jobs because the scarcity of orders has slowed things down. While the first quarter offers little an upturn later is expected. The brightest spot in a dark picture is the new Western Pacific shop near Sacramento which is to be equipped. Extensive inquiries have been sent out for machine tools and other equipment for this shop.

CHIPS

Washington

Roosevelt asserts that U. S. is not for peace at any price, gets prompt support from Landon, Knox and Stimson . . . Submits large list of suggested alterations in Social Security Act . . . Conservative Senate coalition slowed by premature publicity . . . House petitions out amendment making referendum mandatory before war can be declared . . . Hull protests in vain . . . Wage-hour bill sent back to committee by 216 to 198 vote despite desperate efforts of leaders to save it . . . President approves building of two more battleships, asks for legislation tightening restrictions on photographing near fortifications . . . Congress adjourns special session with practically zero accomplishment and leaders plan program for regular session with President, revised labor bill limited to hour restrictions likely . . . Supreme Court bans government evidence based on wire-tapping . . . Bailey defends manifesto of Senatorial coalition . . . Senate Committee report condemns industrial spy system . . . Many companies file objections with committee.

Foreign

French committee appointed to study production problems advocates modification of 40-hour week . . . U. S. gunboat Panay bombed, machine gunned and sunk by Japanese forces creating grave situation . . . Japan apologizes as Roosevelt protests to Emperor Hirohito, removes commanding admiral but army colonel accused of ordering firing from shore and a leader in the 1936 mutiny has not been relieved . . . Great Britain reluctantly gives up hope of joint action with U. S. on China front . . . Chinese dynamite and burn valuable Japanese mill properties at Tsingtao . . . Railway line paralleling trans-Siberian completed by Soviets . . . Great Britain far ahead in navy building but other nations have stepped up programs . . . British and French cabinets consider stronger action in Far East.

Finance

Jesse Jones would cut RFC notes by $2,675,000,000 to simplify bookkeeping . . . Business and farm loans rise as brokers' loans drop.

Industry

Lewis and Murray call Green names at S.W.O.C. meeting but feeling is that factions will get together some time even though peace parleys have broken down . . . Senator Wheeler announces that new legislation will strengthen I.C.C. powers in effort to help railroads, but nobody in Washington knows what to do to solve the problem . . . Mass arrests dampen ardor of pickets at Dearborn and Kansas City Ford plants . . . Reclamation Service chief says force account work on government projects cannot be on closed shop basis, contractors may do as they choose . . . U.A.W. after $500,000 to fight Ford, assesses members who have worked five days in a month $1 . . . Budd gets order for 43 stainless steel cars from the Santa Fe.

Indicators

Steel production drops below 25 as holiday season reduces activity still further . . . Electric power output off . . . *Business Week's* index unchanged at 63.9.

DETROIT LETTER

New car sales held back by heavy dealer stocks of used cars . . . Ford to construct 4,000 homes for workmen . . . General Motors Truck to tool for new engine . . . M.E.S.A. reorganizes to "humor" the Labor Board

DETROIT—No one making the automotive rounds would suspect that the motor industry is winding up the second biggest year in its history. Judging by the long faces on most executives, one would think that this is 1933. Yet the industry this year shouldn't miss the 5,000,000 mark by more than 30,000 units, a 12 per cent increase over 1936.

Since the industry's inception, it has magnified everything. When business flourishes, the sky's the limit on optimism. When it's bad, most Detroiters give the impression that the end of the world is just around the corner. Back around show time, production estimates for 1938 by individual companies totaled over 5,500,000 cars. That figure, of course, was ridiculous. Now it looks as if the output in 1938 would be from 3,750,000 to 4,000,000 cars. If business picks up materially the total might go higher.

Aggressive Selling

Car makers are, as usual, looking at the situation realistically. Aggressive used car selling campaigns are in progress, since high used car stocks must be moved from dealers' floors before new car selling can take a spurt. Factory inventories of raw materials and parts have similarly been reduced.

That the industry is regaining its confidence is evidenced by its intense interest in projected housing programs. Ford is planning the erection of 4,000 low-cost homes for workers near the Rouge plant on Ford property. The project will be undertaken by the Ford Foundation, a non-profit organization which runs Ford's Greenfield Village and the Ford Museum. With the Ford technique of mass production applied to this program, the houses are expected to cost less than $2,500 each.

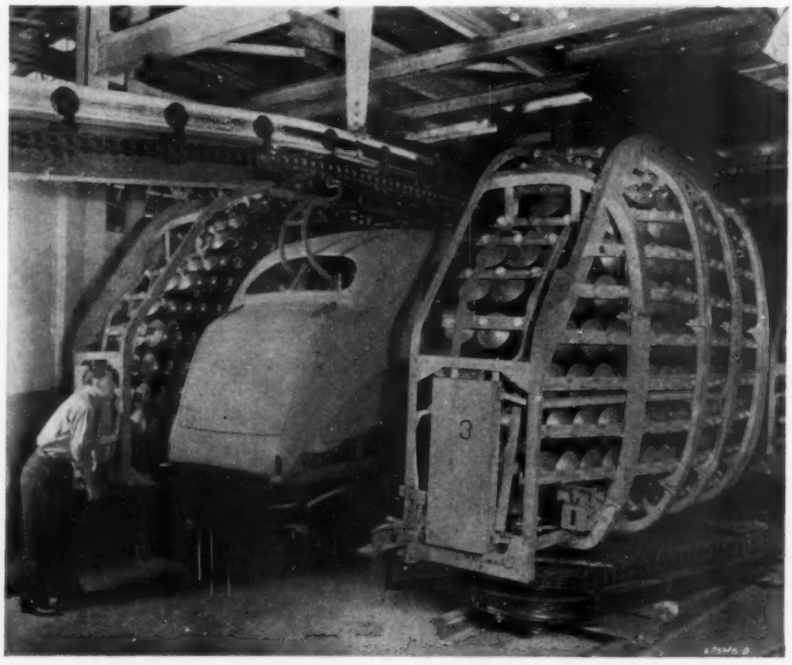
General Motors feels the need of new housing in several quarters. The diesel plant, on Detroit's outskirts, is one location, and several hundred houses may be built in that vicinity. One hundred low-cost houses are scheduled for Pontiac. General Motors itself is not sponsoring the developments, but is reported lending a financial hand.

Chrysler, having taken over the property of the former Wills St. Clair Co. in Marysville, Mich., needs housing facilities there for maximum usefulness of the plant. Apparently it is going to get them, under the auspices of an organization headed by Harold Wills, former Wills St. Clair chief, who has been associated with Chrysler for a number of years.

The so-called reorganization of the Mechanics Educational Society is a notable development. Locals in the Cleveland area have been split into craft and industrial groups. Matthew Smith, M.E.S.A. head, says it's just a move "to humor the Cleveland branch of the National Labor Relations Board," which ruled that a union may not ask for an election to represent a portion of plant workers unless it is organized on a craft union basis. The M.E.S.A. wants an election at Electric Auto-Lite, among others.

The M.E.S.A., which started out as a craft union of tool and die workers, now has a fairly substantial membership of production workers. Under the ruling, these production workers may not be represented for collective bargaining by the M.E.S.A., unless it has a majority of all plant workers. Under the reorganization tool and die workers are now separated from production workers. They must hold their meetings in different rooms, even if the meetings are held at the same time, and in the same building. And they must hold the meetings under different names. Mr. Smith is at least mildly disgusted with the whole situation. "Interpretations of the Wagner Act", he told *American Machinist,* "seem to depend on whether Green or Lewis was interviewed last in Washington."

Whenever car sales for an indivi-



***"Clamshells" on the Enamel-Baking Line*—Ford's body enamel baking process has eliminated the conventional baking oven as mentioned previously (AM—Vol. 81, page 1224e). Instead these clamshells fitted with hundreds of special reflectors direct infra-red rays on the body. Halves of the clamshells travel on conveyors and fold themselves around the body, proceeding with it to the end of the baking line.**

Taking on Ford for a knock-down and drag-out fight, the National Labor Relations Board may well consider what happened when the famous Blue Eagle tried to claw Henry Ford back in NRA days, according to Detroit opinion. The present situation adds emphasis to the article "Will Ford Be Unionized?" which appeared in the December 15 issue on page 1195.

dual manufacturer drop off, Detroit's anvil chorus begins to chant rumors of impending changes in design and of price reductions. This winter is no exception, and this time Plymouth and Chevrolet are the sufferers. As a result it became necessary for President K. T. Keller of Chrysler to wire all dealers that the corporation is not changing its models and does not contemplate price changes. The Chevrolet rumor was particularly ridiculous because the company is leading its price class in sales by a wide margin.

New Truck Models

Minor changes have been made in many cars, as is always the custom for several months after new model introductions. The only new models coming out of Detroit lately are commercial vehicles, including a new Chevrolet taxicab on a 127-in. wheelbase with special frame and Fleetwood body.

Rowland Campbell's election to the chairmanship of Reo's board indicates that the Vanderlip interests are in complete control. Reo recently announced a line of cab-over-engine trucks and is seeking a larger share of the bus business. Toward this end Howard A. Flogaus has been secured from Yellow Coach as chief engineer. Mr. Flogaus is credited with the production engineering and adaptation of the Monodrive automatic transmissions to Yellow Coach buses.

Autostroy, the Soviet engineering organization at Dearborn, has been responsible the past ten days for the purchase of equipment by Amtorg for production of a new six-cylinder car in Russia. The total expenditure is reported to be about 3,000,000 dollars.

General Motors Truck's tooling program for a new six-cylinder motor for its light-weight job, expected to result in equipment orders early in January, is welcome news to the Detroit machinery trade. During the 1938 season G.M. Truck is buying large numbers of engines for its smaller trucks from the Pontiac Division of General Motors. The new tooling program has as its aim the manufacture of such engines by G.M. Truck itself. Early preparations for 1939 are looked for by car factories, especially in ordering new machinery. Equipment builders will be much disappointed if a large amount of business is not placed by March 1.

Other developments. . . . $1,951,000 for new equipment and construction by Toledo Edison for 1938 . . . . cooperative laboratory research activity to be undertaken by Aluminum Co., Aluminum Industries, Advance Aluminum Castings Corp., Bohn Aluminum, National Bronze & Aluminum Foundry Co., and the Permold Co. looking toward increased use of aluminum for automobile cylinder heads, etc. . . . . 50 per cent increase in production by Columbia Axle on its dual-ratio axles for Lincoln Zephyr (optional at factory) and Ford V-8 (optional through dealers) cars. . . . Pinning of medals on "heroes" of sit-down strikes by the U.A.W. with Martin making a speech before the enemy-faction West Side local . . . members of this local were the ones whom Martin met some time ago, gun in hand, when they called on him at his hotel. . . .

G. M. working on a new type of house-organ, patterned on the new photographic magazines and featuring hobbies of employees among other things . . . . everybody more or less forgetting about the question of the GM-UAW contract revision, as the best way out. . . . Graham and Ford about the only companies so far unable to catch up on orders. . . . Carburetor business in the limelight with Carter Carburetor cited by F.T.C. under the Clayton act, and relatively new Chandler-Groves getting some 15-20 per cent of Ford business in addition to standard Plymouths, Packard 6 and part of Dodge truck production. . . .

Ford planning to continue at 4,000 daily, five days a week through January, including the week between Christmas and New ear's . . . . Chrysler temporarily suspending work on new Dodge Truck plant. . . . Pierce Arrow filing a petition under the Federal Bankruptcy act to preserve the status quo until company's reorganization plans can be consummated . . . . the drop in the stock market stopped this one, of course . . . . but you could hardly find a manufacturer or a jobber at the automotive parts show in Chicago two weeks ago who was seriously worried about the business outlook.

E. O. Shreve, G. E. vice-president, was the speaker at a dinner given for visitors to the new Pittsfield plastics plant. At his right is seated G. H. Shill, manager of the Platics Department.

Technical Editors Visit G. E. Plastics Plant

PITTSFIELD, MASS.—The latest link in the General Electric Company's chain of plastic producing units was formally opened on December 2 and 3 when a group of technical editors was invited to visit the new set-up.

C. H. Shill, manager of the Plastics Department, greeted the guests at a luncheon and explained the reasons for the new development. He was followed by H. M. Richardson, of the engineering department, who gave some details of the plant.

The afternoon was spent in the plant in groups of three or four, guided in every case by a G.E. man thoroughly familiar with production operations. A dinner that evening was addressed by E. O. Shreve, vice-president in charge of sales and member of the Plastics Department advisory committee. C. H. Lang, manager of the publicity department and advertising manager, followed with a few pertinent remarks on plastics and publishing.

A.S.T.E. Plans Tool Exhibition in March

A machine and tool progress exhibition is to be held in conjunction with the 1938 annual meeting of the American Society of Tool Engineers. Scheduled for March 9-12, the exhibition will be held at Convention Hall, Detroit. Ford R. Lamb, executive secretary, 5928 Second Blvd., Detroit, is chairman of the exhibit standards and contract committee.

Bachrach

BENJAMIN F. FAIRLESS

WALTHER MATHESIUS

Bachrach

C. V. McKAIG

Big Steel Centralizes Management of its Operations at Pittsburgh

Pittsburgh becomes the "world's capital of steel" on Jan. 1 when the United States Steel Corp. begins control of its far-flung enterprises from that city instead of from New York. Only financial matters will be handled in the future at 71 Broadway.

Decision to control all operations from the Smoky City is the culmination of a ten-year program of adjusting the corporation's capital structure, plant locations, their character, equipment, operations and personnel to meet modern operating conditions. Supervision of subsidiaries will lie in a new management corporation—the United States Steel Corp. of Delaware.

Benjamin F. Fairless, newly elected head of the parent company —the United States Steel Corp. of New Jersey—will also head the Delaware corporation. A testimonial dinner was given for Mr. Fairless by the Pittsburgh Chamber of Commerce on Dec. 20, at which he declared, "The decision to center principal headquarters of the new management company at Pittsburgh was based upon its central location and its general atmosphere of steel operations. The step does not diminish in any way the great importance of the subsidiary companies in Chicago, Cleveland, Birmingham, Duluth and San Francisco."

Officers of the Delaware corporation are: president—Mr. Fairless; vice-president, raw materials—Thomas Moses, now president of Frick Coke Co.; vice-president, operations—Walther Mathesius, now manager of operations, Chicago district, Carnegie-Illinois Steel Co.; vice-president, sales—C. V. McKaig, now vice-president and sales manager, Carnegie - Illinois; vice - president, counsel and industrial relations—William Beye, now vice-president in charge of industrial relations, Carnegie-Illinois; vice-president, secretary and treasurer—Max D. Howell, now vice-president, Carnegie-Illinois; vice-president research—R. E. Zimmerman, now in same position with U. S. Steel; vice-president, purchases —C. H. Rhodes, same position with U. S. Steel; vice-president, special duties—Harold L. Hughes.

Blank & Stoller

R. E. ZIMMERMAN

Blank & Stoller

THOMAS MOSES

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C. H. RHODES

WATCHING WASHINGTON

Lack of new laws did not make special session a total loss . . . Farm and housing bills advanced . . . President likely to reassert "leadership . . . Tax changes may not mean tax relief . . . New plan for shipping stimulus may be forthcoming

WASHINGTON—Significance of Congress' special session was not confined to the passing of a bill appropriating a $225,000 mileage allowance for the members to go home for Christmas. It is true that no important legislation was passed and that the President made no secret of his displeasure at the failure of the legislators to act on the program he laid out for them when the session was called. But the farm bill and the housing bill were moved up to the conference stage, and these two topics were really the only ones that merit a "Rush" label. For regardless of the virtue of these measures, the farm bill to be effective for the 1938 crop and the housing bill for the spring building season will need early passage.

Other pieces of legislation—wage-hour and government reorganization, demanded by the President, and tax reform, demanded by business—can wait for more deliberate consideration during the regular session.

Heat for the Hesitant

When Congress reconvenes on January 3, it is likely to be greeted by a "fighting" message from the Chief Executive which will seek to regain aggressive domination over the legislative branch of government. Whether or not he will succeed only the months immediately ahead can tell. But there is no doubt as to his impatience with the delay in rounding out on the statute books the principles of New Deal philosophy. No new rabbits are likely to be pulled from the hat, but there is sure to be insistent pressure for the passage of measures already outlined.

Even President Roosevelt didn't like the wage-hour bill which the House, in the second big surprise development of that measure's erratic history, voted to re-pigeonhole. There were private assurances to business from the White House, relayed by business paper editors, that the bill would be vetoed unless improved.

But the President is determined to push a new form. This will require a magic formula to produce something which 218 members of the House and 49 senators would rather vote for than against. No one knows the prescription for this formula now. But it must reconcile the A. F. of L. and the C.I.O. It must overcome the southern insistance on a geographical differential or else placate the union men and the zealots who for different reasons do not want a differential.

Part of the formula, a rank outsider suggests, would be the appointment of Edward F. McGrady as Secretary of Labor. But what would Roosevelt do to placate Madame Perkins? And Mrs. Roosevelt?

NOW IT'S THE PRESS

Nobody likes bad news, least of all politicians. For history has shown that the office-holder pays for depressions and even for temporary dips in the business curve despite an air-tight alibi proving it wasn't his fault.

That doesn't prevent him from looking for a scapegoat toward whom he can point an accusing finger. The latest candidate for the whipping boy post is the press. The newspapers, the President says, are spreading gloom. A minority of them have inculcated a psychology of fear, and 95 per cent of them have encouraged it. Just why they do it is not entirely clear, because it certainly hurts their own business by cutting into their advertising revenue.

Big business, the banks, the utilities and the stock market have served their turn in the culprit role. Now it's the papers. The culprit often tosses the ball back to the government, and when there is a real set-back, the government still holds it when Election Day rolls around.

Maybe it isn't fair that the political ins should get the blame for events they are only partially responsible for. Nevertheless, when index charts are ascending, they never fail to point with pride to the effects of their efforts.

So maybe in his inscrutable style that's the way Santa Claus works. If he wears black whiskers sometimes, just remember the Christmas when he brought us a new bureau.

But McGrady as Labor Secretary would go a long ways toward obtaining that majority in the two houses of Congress.

No matter what is written into the new formula by the House Labor Committee the bill does not lose its technical advantage. It has passed the Senate. That advantage will last until January 1, 1939.

Changes in the tax structure will be confined largely to the undistributed earnings and capital gains levies. The drive to close tax loopholes so tied up the Treasury staff that it had insufficient time for the promised overhaul of the whole system of taxation.

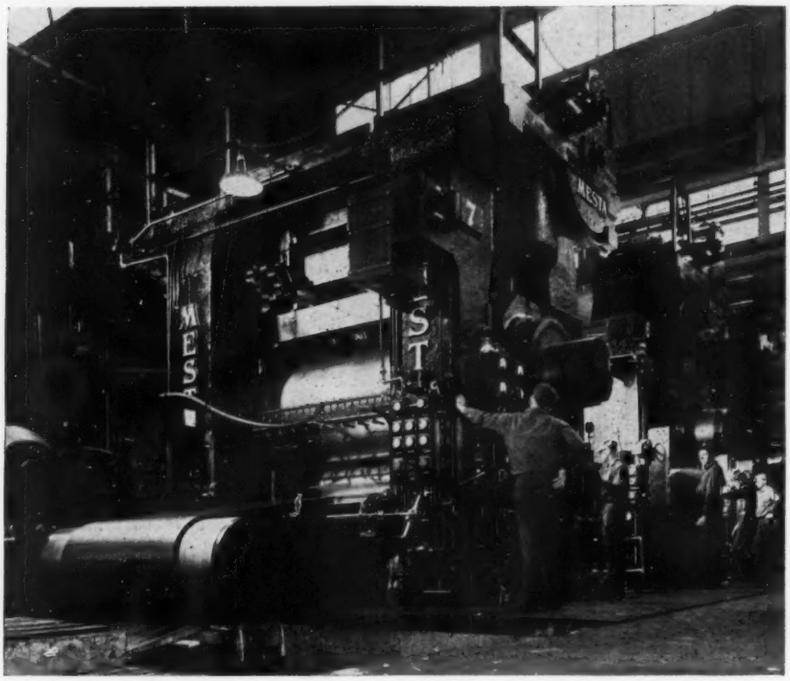
In modifying the surplus tax Congress has no thought of reducing the total corporations have to pay. Whatever revenue is lost as a result of changes in levies on undistributed earnings will be made up by increasing the normal corporation tax. In attempting to meet the argument that the surplus tax has discouraged expansion of plant and purchase of new equipment the Treasury points out that some companies, at least, have not used the full amount of their depreciation allowance for such purposes. One company cited had an allowance of $800,000 for depreciation and spent for new equipment $200,000.

The crop control bill undoubtedly will be enacted. It will have little effect on the demand for farm machinery; manufactures in this field are not much concerned. Several months ago they were invited to sit on important industrial opposition committees and they declined, giving as a reason a desire to avoid part in controversial questions.

Ship Subsidy

Joseph Kennedy leaves his Maritime Commission in grave doubt as to whether the merchant marine subsidy program will succeed. If foreign service does not start building soon after present revision of the act is complete, another way to "buy a merchant marine" will be considered. Intercoastal, coastwise and inland lines, whose ships are down-at-heel, would listen to proposals of a federal subsidy to step up new construction to navy speed standards and to add defense characteristics. Agonized railroads would demand compensation but analysis shows that the ships get less than one per cent of the intercoast cargoes.

There is no thought of revising the federal coordination of the railroads. Relief, if any, will rest in the Interstate Commerce Commission.



Pittsburgh's First Continuous Wide Strip Mill—Jones & Laughlin now have a new $25,000,000 mill operating in all departments. Annual capacity is 750,000 tons of strip, sheet and plate for railroad, shipyard, automotive, air-conditioning, housing and domestic appliance uses. Here is the 93-in. cold-rolling mill, a four-high, three-stand mill which rolls the cold strip in one operation

C. F. Kettering to Speak at S.A.E. Annual Dinner

"The Diesel Engine's Place in Modern Transportation" will be the topic of C. F. Kettering, vice-president in charge of research, General Motors Corp., at the annual dinner of the Society of Automotive Engineers, Jan. 13, at the Book Cadillac Hotel, Detroit. Most of the thirty-two technical papers to be presented at the sessions Jan. 10-14, will deal with aircraft and automotive design, fuels and lubricants. On January 12, Joseph Geschelin, Detroit technical editor, *Automotive Industries,* will speak on "Appraisal of Current Progress in Automotive Manufacturing." Ralph Upson, consulting engineer will present "The Use of Self-Tapping Screws in Mechanical and Structural Assemblies."

Warner Buys Auburn Plant

The Warner Automotive Parts Corp., formerly known as the Warner Gear Co., Muncie, Ind., and a subsidiary of the Borg-Warner Corp., Chicago, has purchased the entire Auburn Automobile Co. plant at Auburn, Ind., with the exception of the administration building. The new corporation is caitaplized at $1,000,000 and headquarters will be at Chicago. Approximately 300 men will be employed when operations begin in the early spring or summer.

Machine Tool Orders Continue in Tailspin

Domestic orders for machine tools in November, as reported by the National Machine Tool Builders Association, were off 29.2 per cent from the previous month and 73 per cent from the best month of the year—April. The precipitous character of the decline is shown by the fact that the average index for the first eleven months is 136.1, whereas the November index is 63.1. Not since the September 1935 has the domestic index reached so low a level.

The total index for the month is bolstered by relatively good business from abroad. Foreign orders reached a peak in September, and a further drying up may be expected. Rearmament on the Continent has been under way for some time, and the initial phase—re-equipping of the shops—is probably about over. For this reason, as well as the domestic situation, the total index is likely to go lower in succeeding months.

Back Copies

Arthur W. Suiter, 13 Mayfair Road, Edgewood Station, Providence, R. I., has copies of *American Machinist* dating back to 1906 which he wishes to dispose of. Anyone interested should communicate with him.

Index of Machine Tool Orders

Based on Volume of Shipments for 1926

Month	Index of Orders: Domestic	Index of Orders: Foreign	Index of Orders: Total	3 Months' Average Index	% Foreign to Total Orders
1936 — November	110.7	36.4	147.1	134.0	25
December	205.7	52.0	257.7	180.4	20
1937 — January	156.1	44.0	200.3	201.7	22
February	122.4	42.8	165.2	207.7	26
March	172.1	39.5	211.6	192.4	18
April	232.5	50.0	282.5	219.8	18
May	161.4	47.1	208.5	234.2	22
June	137.6	54.2	191.8	227.6	28
July	115.4	55.7	171.1	190.5	32
August	129.5	50.3	179.8	180.9	28
September	119.0	91.7	210.7	187.2	42
October	89.1	62.9	152.0	180.8	43
November	63.1	64.4	127.7	163.5	50

Distribution of Orders

Average Indexes of Individual Companies Based on 1926 Level of Business	Companies In Per Cent of Total Number Reporting: 1936 1st Quar.	1936 2nd Quar.	1936 3rd Quar.	1936 4th Quar.	1937 1st Quar.	1937 2nd Quar.	1937 3rd Quar.	1937 Oct.	1937 Nov.
200–up	13.0	17.2	15.8	28.4	31.6	38.5	33.4	27.2	22.4
100–199	24.6	32.6	28.8	30.2	32.8	29.1	30.2	28.0	18.7
60– 99	22.4	19.0	22.9	19.5	16.4	15.1	15.7	19.1	20.1
20– 59	26.5	21.8	21.7	15.2	12.2	11.4	12.7	16.9	26.1
Less than 20%	13.5	9.7	10.8	6.7	7.0	5.9	8.0	8.8	12.7

Japan Plans to Speed Import Licenses

TOKYO—While the Cabinet's planning board is still awaiting the answers to its queries from machine-tool importers, the Finance, Navy, War and Commerce authorities are reported to be discussing a scheme for the organization of a joint committee to handle matters relating to the importation of tools. This measure is intended to rectify a defect arising from occasional lack of understanding between the finance authorities and the leaders of other departments. It is pointed out that often orders of a non-urgent nature are licensed promptly by the finance authorities just because the amounts involved are small, while even munitions companies are kept waiting, because their orders involve large amounts of foreign exchange. Through the establishment of a joint committee the promoters expect that a smooth connection will be maintained between the Department of Finance and the Commerce, War, and Navy offices, thus having import licenses adjusted properly.

The Ministry of Finance has, since the beginning of the current fiscal year, licensed import exchange for foreign machine tools to the extent of nearly 40,000,000 yen, which is approximately twice as much as last year.

Since April, the first month of the fiscal period, import applications involving some 80,000,000 yen have been filed, the paper continues. This means that only one-half of the applications were approved.

PERSONALS

General Electric Advances Charles E. Wilson

Charles E. Wilson, vice-president in charge of the General Electric Co.'s appliance and merchandise department at Bridgeport since 1930, has been elected executive vice-president of the company, a new position. The announcement was made by Gerard Swope, president.

Mr. Wilson has been with General Electric, and the Sprague Electric constituent, since 1899. He was factory accountant, production manager and assistant superintendent of the Sprague factory. Following the transfer of the conduit business from Sprague to General Electric in 1918, he became assistant general superintendent of the Mazpeth and New Kensington Works. In 1923 he went to Bridgeport as managing engineer in charge of the conduit and wire business, and two years later he was appointed assistant manager of General Electric's Bridgeport Works.

CHARLES E. WILSON

Mr. Wilson devoted his attention to the manufacturing problems of the appliance business and became manager of the merchandise department in 1930. He then became a vice-president, and in 1935 was assigned responsibility of directing all appliance activities.

LOUIS B. STONER has been elected treasurer of the Jacobs Mfg. Co., Hartford, Conn., to succeed HUBERT M. TOPPIN, who will devote his entire time to his executive duties as president. Mr. Stoner is the son of LOUIS E. STONER, chairman of the board.

B. N. BROCHMAN, western sales manager for the R. K. LeBlond Machine Tool Co., at 20 N. Wacker Drive, Chicago, has been with that company for 25 years. He started in the LeBlond shop in December 14, 1912 as an inspector in the lathe department and has gone step by step to the post he now occupies.

J. E. MACMAHON, formerly assistant manager has been appointed general sales manager of Graton & Knight Co., Worcester, Mass., to succeed C. O. DRAYTON, resigned. Mr. MacMahon has had many years of experience with the company.

JAMES A. GOULD, president of Pratt, Read & Co., has been elected president of the Moore & Fisher Mfg. Co., Deep River, Conn., to succeed STANLEY L. FISHER, who is retiring. E. W. MOORE, succeeds Mr. Fisher as treasurer, and will also be active manager of the company, which manufactures piano actions.

F. W. CEDERLEAF, well known in the automotive and machine tool fields, and recently with the Ex-Cell-O Corp., Detroit, has become general sales manager of the Diesel Equipment Corp., 4401 Ravenswood Ave., Chicago, manufacturers of fuel pumps for diesel and oil engines.

P. H. MACGREGOR has been promoted to the position of general manufacturing manager of the Pontiac Motor Car Co., according to HARRY J. KLINGER, president. R. H. AHLERS succeeds Mr. MacGregor as general plant manager.

Machine Tool Engineer Is Honored—Constant Bouillon, chief engineer of the Hendey Machine Co., Torrington, Conn., was recipient of testimonials on Nov. 12 for 50 years of service. Left to right—W. P. Norton, inventor of the quick-change gearbox first applied to Hendey-Norton lathes in 1892; David Ayr, president of Hendey, and Mr. Bouillon

Edward Rivett

Edward Rivett, founder of the Rivett Lathe & Grinder Inc., Brighton, Boston, Mass., died Dec. 16 at the age of 86. Mr. Rivett believed himself to be the originator of precision in bench lathes and small internal grinders. After much varied experience and extensive traveling, he began the business in 1884 in an annex to his home and retired in 1912.

Unusual mechanical skill, an inquiring mind, and initiative were qualities that aided Mr. Rivett in building precision into his machines. His designs were worked out at the bench and his men built early models from sample pieces. In the search for greater precision he visited many shops in this country and abroad to pick up ideas or materials. From Switzerland he obtained gages, in Turkey he bought a lifetime supply of lapping powder. If he wanted special gib stock, he went directly to the mill and showed them what he needed. In his opinion many modern shops have an impersonal attitude toward their products, and it was his delight to find one where no amount of time or trouble was too much to give in the search for perfection.

BUSINESS ITEMS

Neff, Kohlbusch & Bissell, machine tool designers and dealers, 2255 West Madison St., Chicago, are showing 27 machines, the product of twelve companies which they represent and some of thir own designs, at the third of a series of biennial exhibits on January 18-19. The exhibit which includes two new type welders, a new 150-ton press, and a new Maag gear grinder will be held at the plant of the Service Tool, Die & Mfg. Co., 4625 West Fulton St., Chicago. It will be open to superintendents, foremen, and purchasing agents.

The Modern Collet & Machine Co., Ecorse, Mich., announces that WARD H. RICE, formerly a buyer for the International Harvester Co., is now its sales representative in Wisconsin. Mr. Rice's offices are located at 437 Commerce Bldg., Milwaukee.

George D. Miller Co., machine tool dealer, has moved its offices to larger quarters at 509-11 Rockefeller Bldg., Cleveland.

The Martindale Electric Co., Cleveland, Ohio, has purchased the Hergi Manufacturing Co., Bridgeport, Conn., and has moved the factory to Cleveland, where Martindale will continue the manufacture of motor-driven flexible shaft equipment and carbon, alloy, and high-speed steel rotary files, rasps and burrs.

Carl Zeiss, nc., which recently established a special department at 485 Fifth Ave., New York, N. Y. to handle sales and servicing of precision gaging tools, measuring instruments, toolmaker's microscopes and projectors, has appointed district representatives as follows: SID LANGSTON, 1213 West Third St., Cleveland, to represent Zeiss in Northern Ohio; EDWARD W. VOSS, 2882 East Liberty Ave., Pittsburgh, to represent Zeiss in Pittsburgh, Western Pennsylvania and West Virginia; Higgins & Linde, Inc., 564 West Randolph St., Chicago, to represent Zeiss for Chicago, Southern Wisconsin and Northern Indiana.

Otto Wilhelmy & Son, 1268-69 Commercial Trust Bldg., Philadelphia, Pa. have been established by OTTO WILHELMY as manufacturers' representatives for machine tools, diemaking machines, arc welders, spot welders, shears, saws and metal-cutting tools. Mr. Wilhelmy was formerly in charge of the machinery department at Joseph T. Ryerson & Son, Inc.

Hanson-Van Winkle-Munning Co., Matawan, N. J., manufacturers of electroplating equipment and supplies, has added a new office building and made an extension to the electrical shop.

OBITUARIES

FRANK B. BLACK, chairman of the board, Ohio Brass Co., died Dec. 19 at Mansfield. Mr. Black, who was 72, founded the company half a century ago.

FLOYD E. BADGER, sales manager of the Detroit Steel Products Co., Detroit, died recently. He had been factory manager of the Standard Parts Co., Cleveland, and a vice-president of the Armstrong Spring Co., of Flint.

TIMOTHY BURNS, former general manager of the Lackawanna Works, Bethlehem Steel Co., died recently. Mr. Burns retired in 1936 but continued in an advisory capacity at Bethlehem.

OTTO RUPPRECHT, vice-president of the Wittemann Co., Buffalo, maker of brewery machinery, died on Dec. 20. He was 69.

E. F. ZITZEWITZ, president, Aetna Ball Bearing Mfg. Co., Chicago, died Dec. 10.

W. B. BRINTON, former president of the J. I. Case Co., makers of farm machinery, died in Tucson, Ariz., Dec. 19, of heart disease. He was 87.

MEETINGS

AMERICAN ENGINEERING COUNCIL. Eighteenth annual assembly, Jan. 13-15. Hotel Mayflower, Washington, D. C.

AMERICAN MANAGEMENT ASSOCIATION. Eighth packaging exposition, March 22-25, Palmer House, Chicago.

AUTOMOTIVE ACCESSORY MFRS. ASSOC. Eleventh annual exposition, Feb. 28-Mar. 1. Port Authority Bldg., New York.

INTERNATIONAL AIR SHOW. Exhibit of equipment and supplies, Jan. 28-Feb. 6. International Amphitheatre, Chicago.

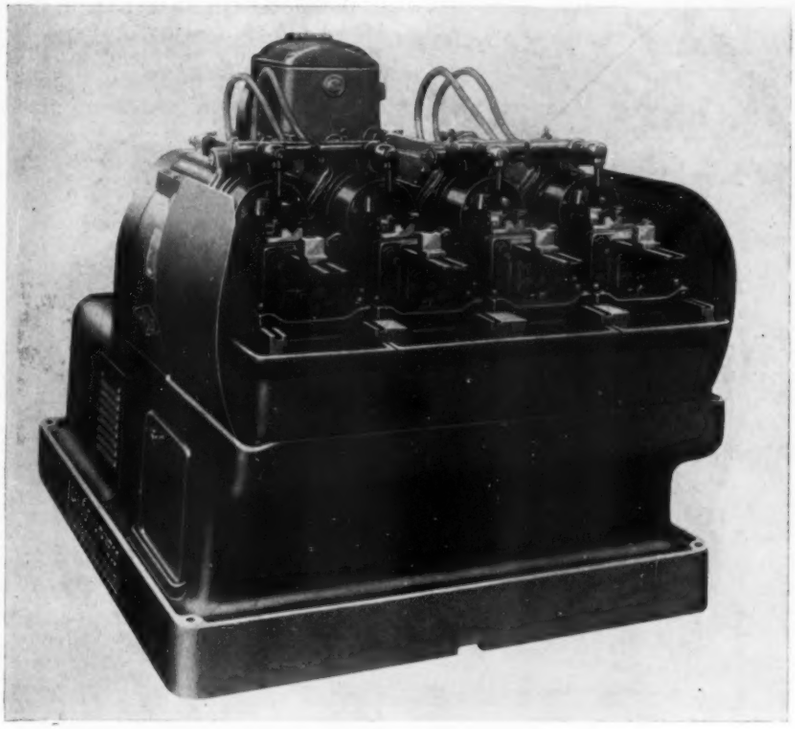
INTERNATIONAL HEATING & VENTILATING EXPOSITION. Jan. 24-28. Grand Central Palace, New York.

NATIONAL MOTOR BOAT SHOW. Jan. 7-15. Grand Central Palace, New York.

NATIONAL RAILWAY APPLIANCES ASSOCIATION. March 14-17. Chicago.

SOCIETY OF AUTOMOTIVE ENGINEERS. Annual meeting, Jan. 10-14. Book-Cadillac Hotel, Detroit.

SHOP EQUIPMENT NEWS



Landis Four-Spindle Semi-Automatic Cam-Actuated Threading Machine

Movement of the diehead spindles and the opening of the work grips is actuated by cams in the four-spindle semi-automatic bolt threading machine announced by The Landis Machine Co., Inc., Waynesboro, Pa. This machine will handle bolts of any length from $\frac{1}{4}$ to $\frac{3}{4}$ in. in diameter and will cut a maximum thread length of $3\frac{1}{2}$ in. Operating cycle reduces manual labor to the placing and removing of work from the grip. The four diehead spindles are closely coupled, making it unnecessary for the operator to move from one position to place work in any pair of grips. Cycle of the machine is controlled from a fully inclosed pick-off type gearbox, which drives the camshafts and cams. These actuate the diehead-spindle travel and grip movement, as well as the rotation of the diehead.

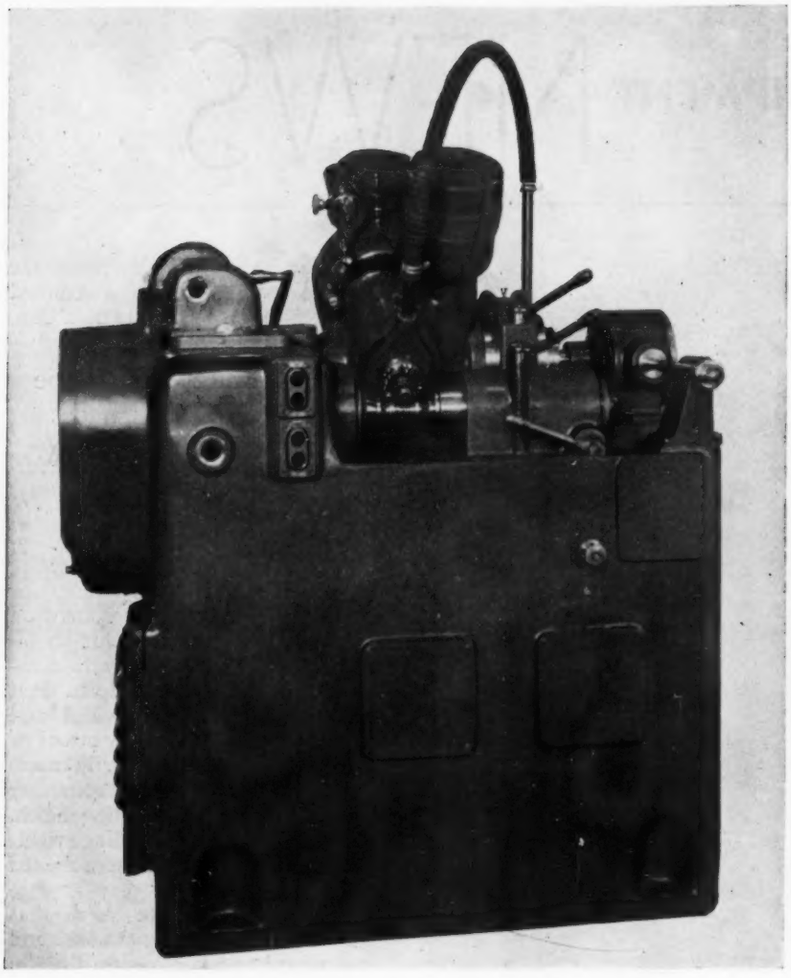
Each diehead spindle is mounted on anti-friction bearings and has both a rotary and sliding action in its housing. Forward movement of the spindle is actuated by a spring which moves the die head under a heavy starting pressure until one or two threads are cut, after which a lighter or follow-up pressure is applied and exerted for two or three threads. Starting springs are adjustable to suit threads of different pitch and various materials.

Upon completion of the thread-cutting operation, the diehead opens automatically. Dieheads are of the pull-off type and are opened by a threaded stud on the spindle housing, which strikes a pad on the gripper jaw housing. This stud is threaded to permit accurate adjustment for thread length. When the diehead opens, the head is returned to rest position by means of a cam.

Philadelphia Box-Type Tempering Furnaces

Box-type convection heating furnaces, having three or more trays on which work is placed, have been developed by The Philadelphia Drying Machinery Co., 3351 Stokley St., Philadelphia, Pa. Design allows for cross circulation and for operation from 300 to 1,300 F., with an internal combustion chamber to eliminate heat losses from ducts. Full automatic control is provided and each furnace is gas fired by means of a low-pressure gas burner. Furnaces are heavily insulated with refractory brick backed with insulating block. Doors are of the self-sealing, tight-closing type and are counterweighted for easy operation.

The smaller furnace shown has a 24x24x28 in. heating chamber and is designed to accommodate 600 lb. of tool steel. Operating range of this furnace is from 200 to 800 F. Four removable trays on 6-in. centers are provided. The larger furnace has a 36x36x36 in. heating chamber and accommodates approximately 1,000 lb. of tool steel. Operating range is from 300 to 1,200 F. There are five removable trays.



Fellows Type 6T Hourglass Worm Thread Generator

Arranged with automatic electric control to facilitate operation, the No. 6T hourglass thread generator offered by The Fellows Gear Shaper Co., Springfield, Vt., is claimed to make possible the production of accurate and smoothly-finished worm threads at a high production rate. Work is customarily held between cones, one on the stub driving arbor in the headstock, and the other on the tailstock center. Cutter is kept in step with the threads on the work.

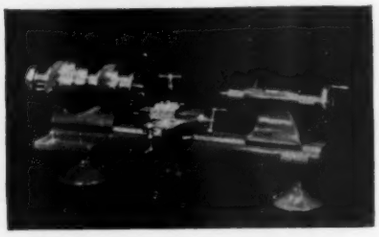
Depth feed cam is provided with a depression which allows the cutter head to be automatically elevated when the worm is finished, thus permitting removal and insertion of work. This cam is made so that the majority of the stock is removed with a fairly coarse feed, then the feed is reduced for the remainder of the cut. At the end of the cut the tool is allowed to dwell for several revolutions to produce a smooth finish on the work. The machine is operated by a starting lever connected to the electrical pushbutton control and the feed cam.

Specifications: Maximum pitch, $\frac{3}{4}$ diametral; maximum helix angle, 15 deg.; maximum pressure angle, $14\frac{1}{2}$ deg.; maximum work and cutter center distance, $3\frac{3}{4}$ in.; minimum work and cutter center distance, $1\frac{3}{8}$ in.; maximum outside diameter of cutter, $5\frac{1}{2}$ in. Net weight with motors and electrical equipment is 5,000 lb. Over-all length is 57 in., width is 43 in. and height is 63 in.

Hardinge "Cataract" Open-Cone Lathes

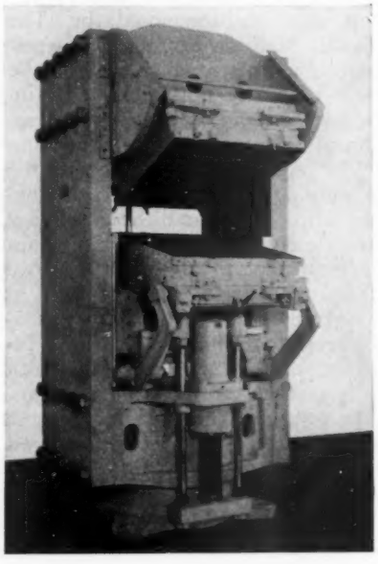
Preloaded ball-bearing spindle construction is now offered, by Hardinge Bros., Inc., Elmira, N. Y., in the open-cone style precision bench lathes. Greater accuracy, heavier cuts, and higher spindle speeds are said to be possible with this construction. The front bearing section receives oil through a cut located at the rear of the headstock, and the rear bearing is greased and sealed for life. Both bearing sections are sealed with cork to exclude dirt and foreign matter.

These lathes are available in five styles, with capacity through collets and draw-spindle ranging from $\frac{1}{2}$ in. in the Model OB-37 to 1 in. in the Model OB-59. Swing over bed is 7 in. or 9 in., depending on the model selected. In all cases maximum distance between centers with a 32-in. bed is 13 in. This is increased to 17 in. with a 36-in. bed. All models are capable of 3,000 r.p.m. high spindle speed.

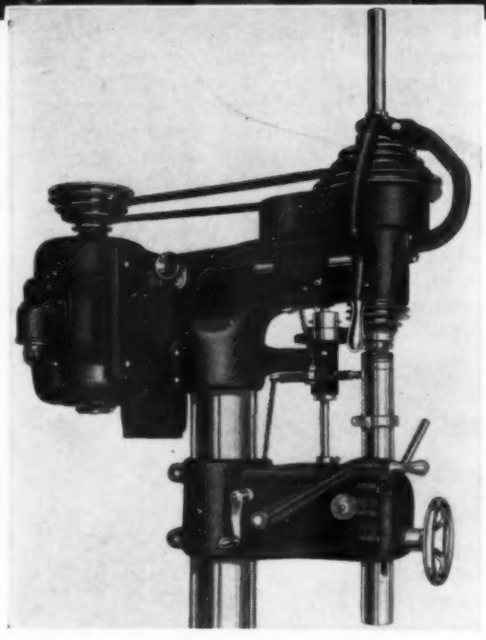


"Lake Erie" Automatic Hydraulic Molding Press

An automatic tilting-platen hydraulic molding press of 1,000-ton capacity is offered by Lake Erie Engineering Corp., 268 Perry St., Buffalo, N. Y. This press is suitable for molds measuring 38 x 38 in. Automatic multiple ejection of the mold forms is provided. Presses are suitable for use with self-contained pumps or for accumulator operations. It is claimed that automatic operation makes it possible for one man to operate four presses.



"You Bet I like this *New* "Buffalo" No. 22 DRILL"



o "I like it because it's so easy to operate—all the levers are within easy reach. It's easy to change from one job to another—The work is better—And my production is up. That 4-point pressure lubrication is a swell idea too. And it drills large holes faster than any drill we've ever had."

Your men, too, will like this better drill. Our Bulletin No. 2989-B tells the whole story. Write for it now.

BUFFALO FORGE COMPANY

448 BROADWAY, BUFFALO, N. Y.

Branch Engineering Offices in Principal Cities

In Canada: Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

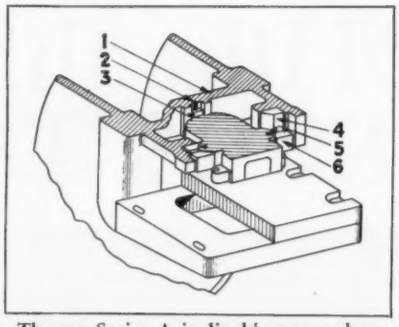
Thomas Inclinable Power Presses

Series A open-back inclinable punch presses announced by Thomas Mfg. Co., Pittsburgh, Pa., feature an accurate, long-wearing, three-point support for the slide and adequate lubrication for the gibs at all points. Wearing parts are adjustable and, when necessary, can be replaced without remachining the frame.

Slide moves vertically in double 45-deg. gibs of hardened steel. The back gibs are bolted to the frame while both the left and right front gibs are adjustable. A hardened steel key is doweled and bolted to the slide and is accurately fitted in a slot in the heavy cross member which is cast integral with the frame and extends vertically the entire length of the gibs. Oil reservoirs are cast in the slide at each side and radial outlets are provided at points throughout the gib length. A similar oil channel is provided to lubricate the sliding key at the rear of the slide.

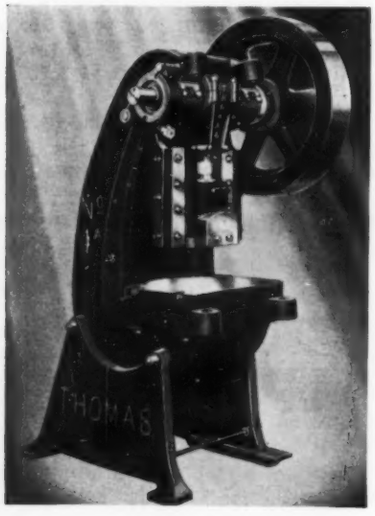
Main bearings are of the 45-deg. split type which transmit the thrust directly to the frame. The safety clutch used permits single stroke, non-repeat or continuous operation at the will of the operator. Means are provided for locking the press out of operation when setting dies or making other adjustments. All clutch parts subject to wear are of alloy steel, heat-treated to suit requirements. The one-piece pitman is connected with the slide by means of a buttress thread screw of the ball and socket type.

An elevating screw is provided for inclining the presses in all sizes where weight permits such construction. It is claimed that very little change in the die-to-floor height occurs when the press is inclined, even to the full 30 deg. These presses can be furnished as plain or flywheel-drive types or geared. Motor drives are available in flat or V-belt types or with the motor pinion geared directly to the flywheel.



Thomas Series A inclinable presses have back gibs (4) bolted to frame while front gibs (6) are adjustable. Steel key (3) is fitted to slide and runs in slotted cross member (1) cast in main frame. Oil reservoirs (5) are cast in each side of slide and oil channel (2) lubricates sliding key

A three-point support for the slide is featured in the Thomas Series A inclinable power presses

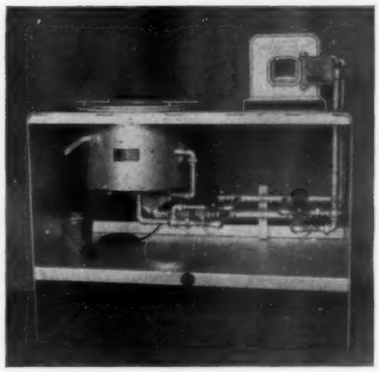


Seven standard sizes are now listed, with rated capacity based on diameter of crankshaft, of 10, 14, 21.8, 31.5, 36.9, 56 and 78.7 tons respectively. An eccentric-type main shaft is used in the five smaller sizes for strokes up to 2-in.; all other presses in the line have crankshaft-type main shafts. Standard stroke ranges from 1½ in. in the smallest size up to 4-in for the two largest size presses. Area of bolster, front to back and right to left, ranges from 7x14 in. for the small sizes up to 28x36 in. in the large. Likewise, the shut height, with stroke down and adjustment up, ranges from 5 in. to 13 in. and vertical adjustment of slide ranges from 1½ in. to 3 in. Standard speed, in strokes per min., ranges from 200 in the small size to 90 in the large.

A.G.F. Furnace Table

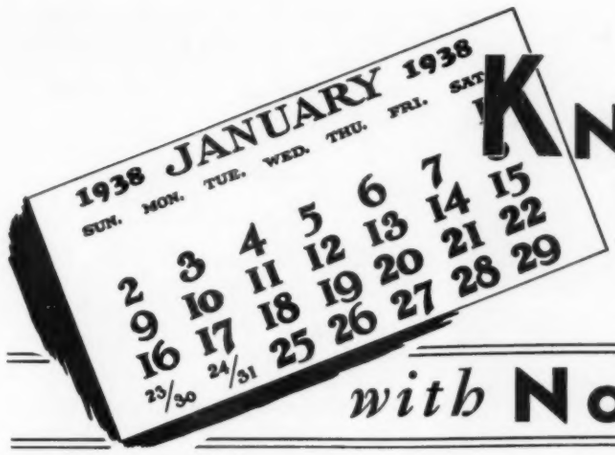
Pot furnace unit of the furnace table announced by the American Gas Furnace Co., Elizabeth, N.J., is suitable for soft metal melting, lead hardening, cyaniding, or other salt bath heat-treating. For this purpose the pot furnace is equipped with a pressed steel pot that measures 4 in. inside diameter by 8 in. deep. A cast-iron pot suitable for aluminum melting measures 4½ in. diameter at the top by 7 in. deep. This pot has a refractory cover.

The forge has a depth of 4 in., and a 3 in. wide by 2½ in. high opening. This is closed by an insulated door. A similar opening having a removable plug is provided at the rear to permit inserting long rods for heating at mid point for bending or shaping. A heat-resisting alloy hearth converts this forge to an oven furnace for hardening, annealing and normalizing operations. Raw gas burner is located between the regular burner for the dual purpose of atmosphere control and to act as a pilot light. Steel table is 24 in. wide and 48 in. long.



"Summit" Model 19 Pressure Controller

The "Summit" air-operated Model 19 pressure controller offered by Industrial Instrument Co., 96 E. Miller Ave., Akron, Ohio, is claimed to maintain constant pressure on the equipment to which it is connected. It is sensitive to less than ¼ lb. pressure change. Cover is arranged with an adjusting knob with pointer to indicate the setting. Base casting is drilled for air passage to all connections, with no pipe or tubing inside the case. An air leak adjustment is located outside the case. The three gages furnished with this controller indicate all operations, such as initial air pressure, pressure required to operate diaphragm valve and indication of pressure under control. These instruments are available for eight pressure ranges, the first being 1 to 15 lb. and the last, 75 to 500 lb. Air pressure required to operate the instrument is 25 lb. per sq. in.



KNIGHT *MAKES* **BIG** *NEWS for 1938*

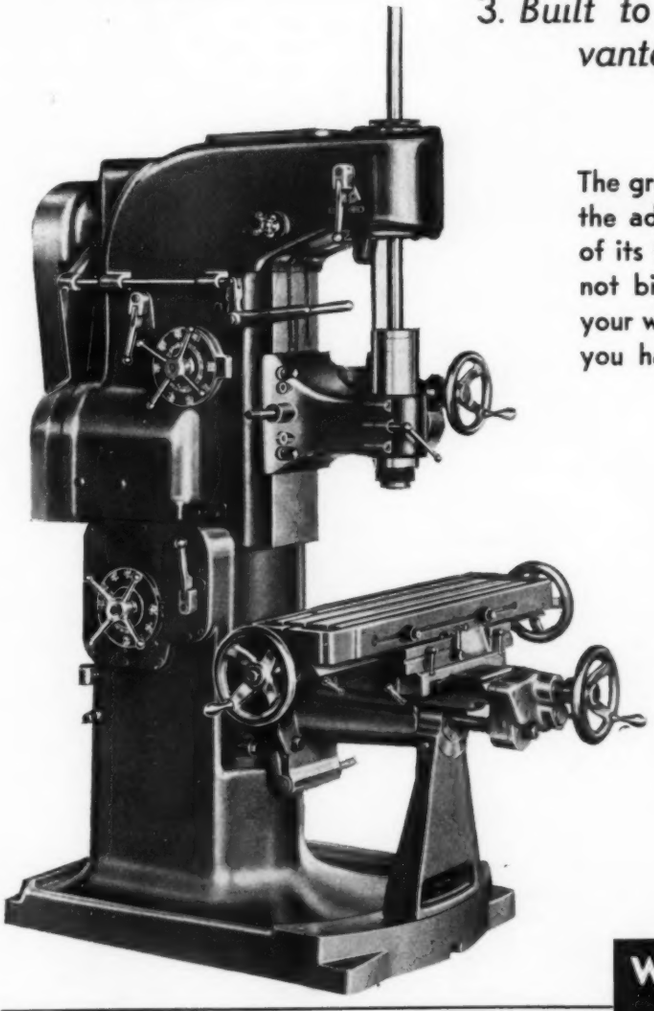
with No. 30 MILLER

KNIGHT VERSATILE MILLERS ACCURATE - RIGID

1. *It is a smaller model of the Successful Number 40*

2. *Designed like the Knight 40 to increase the profits on a wider variety of work*

3. *Built to give more users the many advantages of the Knight 40 without as great an investment*

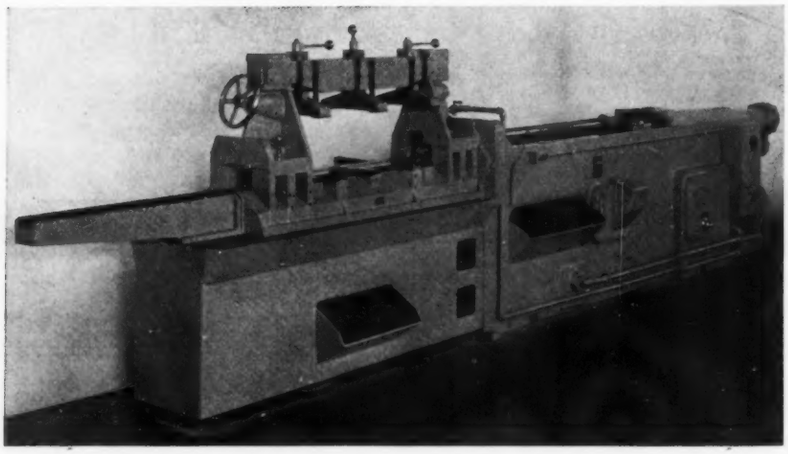


The growing acceptance of the Knight 40, suggested the advisability of a smaller size Miller retaining all of its features. If your production requirements are not big enough for the Knight 40, or the type of your work such that a smaller miller is advisable, then you have the exact answer in the new Knight 30.

Be sure to get acquainted with Knight 30

• Write for new bulletin which tells about the ease and convenience of getting adjustments—how you can quickly and accurately machine difficult and unusual parts without special equipment—how the swivel table makes a bigger milling machine out of it—and how you get more in production results out of your investment. Many other features too!

W. B. KNIGHT MACHINERY CO.
• ST. LOUIS, MISSOURI •



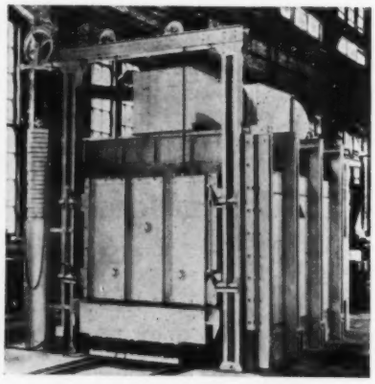
Colonial Special Bearing-Seat Hydraulic Broaching Machine

Designed to broach bearing seats in an automobile engine cylinder block, this special broaching machine developed by Colonial Broach Co., Detroit, Mich., consists of a standard universal broaching machine with fixtures built up on a separate base and bolted to the faceplate of the machine. This unit is arranged so that the cylinder blocks can be slipped into place directly from the roller conveyor without requiring handling with hoisting equipment. Blocks are located over dowel pins and are clamped from end and top.

Broaching is automatic, the broach being pulled through the block with a 60-in. travel of the broach heads. Ram has a capacity of 10 tons and approximately 1/32 in. stock is removed to finish completely the bearing seats to close tolerances. A variable-speed adjustment and high-speed return makes possible a production of approximately 60 blocks per hour, including loading and unloading time.

M. & W. Finish for Rubber

A special bronze lacquer, designed to give rubber parts or products a metallic finish that will harmonize with the metals with which they will be used, has been developed by Maas & Waldstein Co., 438 Riverside Ave., Newark, N. J. This rubber lacquer is said to make it possible to cover semi-stiff rubber with a strongly adherent, durable finish resembling brass, copper, bronze, aluminum, steel or other metals. It consists of a bronzing liquid to which metal powder of any kind is added just prior to use. The mixture is applied by spraying and air-dries rapidly.



P.D.M. Car-Type Convection Furnace

Inside working dimensions of this car-type convection-heated furnace, offered by The Philadelphia Drying Machinery Co., 3351 Stokley St., Philadelphia, Pa., are 5 ft. wide, 8 ft. long and 4 ft. high above the deck of the car. This furnace is used for stress relieving machine parts and cast-iron motor frames. Car is operated on ball-bearing wheels and both door and car are of the self-sealing type. Insulation consists of refractory brick plus insulated block. All exterior duct work and equipment are suitably insulated.

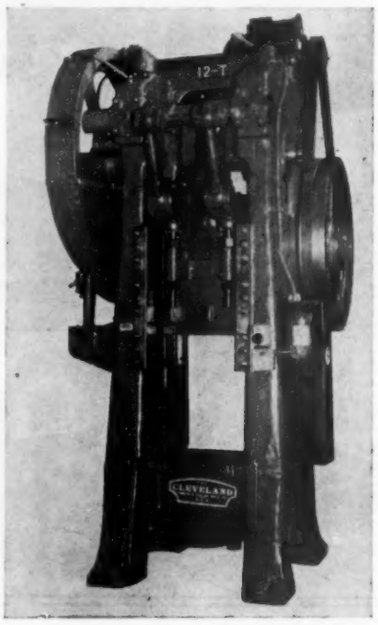
Temperature of operation ranges from 300 to 1,300 F. on any predetermined cycle. Recirculating fan is located on the cold side of the recirculating system and pulls the return air from the furnace, discharging it through an inspirator where it pulls the products of combustion from the combustion chamber, thus heating the circulating air. Heated air is distributed along each side of the work chamber by suitable heat-resisting duct work. These furnaces can be either oil or gas fired, the unit shown being fired by two low-pressure oil burners. Heating cycle is under full automatic control.

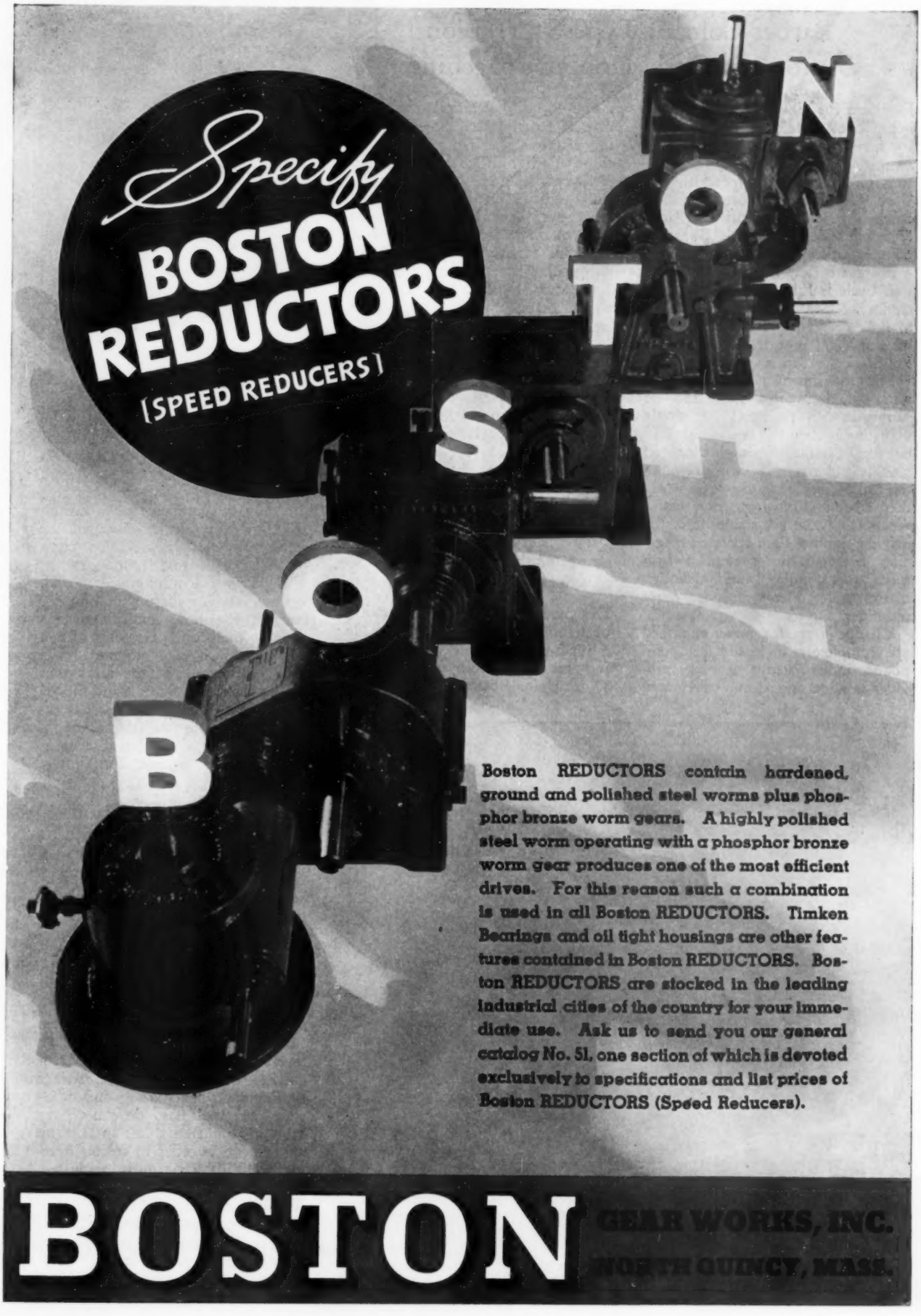
Fostoria Lamp-Socket Seal

A rubber socket-seal, designed for use in conjunction with lamp bulbs and sockets, has been developed by The Fostoria Pressed Steel Corp., Fostoria, Ohio. This seal consists of a molded rubber collar which fits over the opened end of the socket, so that when the lamp bulb is inserted the socket-lamp union is fully protected. This is claimed to prevent short-circuits resulting from the entrance of dirt, chips, cutting oils and other materials into the socket. The lamp end of the seal is feather-edged.

Cleveland No. 12-T Double-Action Press

An electrically controlled, hydraulically operated friction clutch is featured on the No. 12-T single-crank, double-action, toggle press, offered by The Cleveland Punch & Shear Works Co., 3900 St. Clair Ave., Cleveland, Ohio. This press is designed for economical use of floor space, with the gearing, clutch and component parts located between the uprights. The customary outboard bracket has been eliminated. Press operates at the rate of seventeen strokes per min. Bed area measures 28 in. front to back and 26 in. right to left. Stroke is 20 in., with a 4-in. adjustment.




Specify
BOSTON
REDUCTORS
(SPEED REDUCERS)
B O S T O N
Boston REDUCTORS contain hardened, ground and polished steel worms plus phosphor bronze worm gears. A highly polished steel worm operating with a phosphor bronze worm gear produces one of the most efficient drives. For this reason such a combination is used in all Boston REDUCTORS. Timken Bearings and oil tight housings are other features contained in Boston REDUCTORS. Boston REDUCTORS are stocked in the leading industrial cities of the country for your immediate use. Ask us to send you our general catalog No. 51, one section of which is devoted exclusively to specifications and list prices of Boston REDUCTORS (Speed Reducers).
BOSTON
GEAR WORKS, INC.
NORTH QUINCY, MASS.

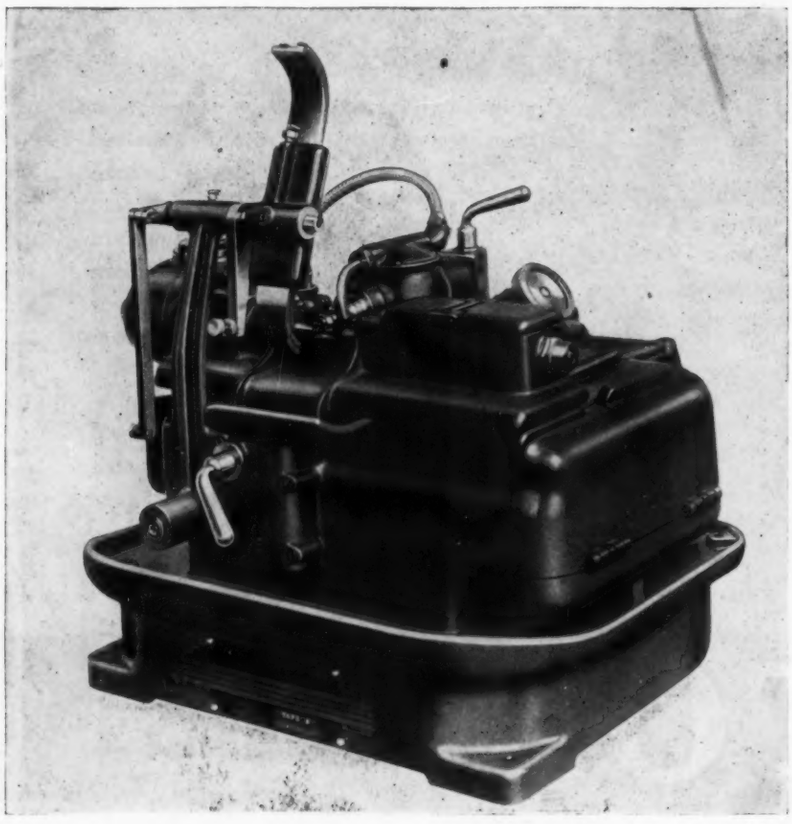
Barber-Colman Type S Precision Automatic-Cycle Hobbing Machine

Designed for high-speed, continuous hobbing of spur gears and pinions for small precision instruments, such as meters, clocks, watches, cameras and motion-picture apparatus, the Type S bench-type hobbing machine offered by Barber-Colman Co., River & Loomis St., Rockford, Ill., will handle work up to 1 in. diameter by ½ in. face of any machineable material. Cycle is fully automatic and includes work-loading, rapid approach to hob, feed, quick return, ejection of work and repeat. Operator only has to keep the magazine loaded.

Machine shown is for bench installation, but these units can be supplied with pedestals for single floor installation, or with base for battery of units. Spring-loaded tail spindle automatically withdraws at the end of each cycle to release work, then advances, moving a new workpiece from the magazine into the driving spindle. Cam-operated magazine automatically presents workpiece to spindles, holds enough blanks to let operator service other machines.

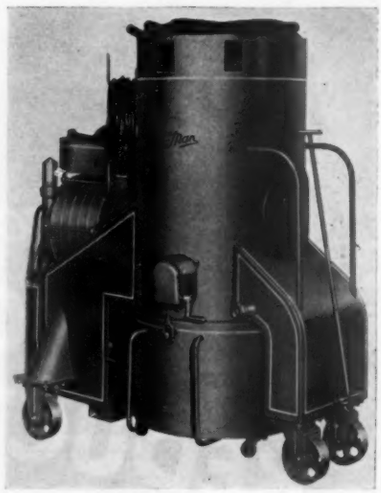
Change gears for index and feed are completely inclosed and compound index change gearing provides a wide and closely integrated range of ratios. Vertical adjustment of hob is maintained by a quick-acting clamp at the front of the machine. Feed cam governs full-automatic cycle. Automatic trip lever controls reliable one-revolution clutch that governs work-handling mechanism. A direct-driven pump provides lubricant to every working part.

Specifications: Capacity, diameter, 1 in.; capacity, face, ½ in.; diametral pitch, brass, 24; diametral pitch, steel, 32; maximum travel of slide, 1 in.; maximum distance from centerline of work spindle to centerline of hob spindle, 1 in.; minimum hob speed, 500 r.p.m.; maximum hob speed, 1,500 r.p.m.; number of hob speeds with gears furnished, 19; number of feeds per revolution of work, 19; motor required, ⅓ hp.; bench space, 24 x 26 in.; net weight, 310 lb.



"Hoffco" No. 5 Cleaning Unit

Designed to remove large quantities of accumulated dust, the Hoffco No. 5 super-duty portable vacuum cleaning unit announced by Air Appliance Div., United States Hoffman Machinery Corp., 105 Fourth Ave., New York, N. Y., is claimed to be capable of several hours of continual operation on heavy deposits of dust before it is necessary to stop work and empty the container. This dust container is equipped with a raising and lowering device actuated by crank handle. It is mounted on a separate set of wheels, independent of those on which the unit is moved.



Provision is made on the unit for carrying the hose and all of the cleaning tools and accessories. When the operator is ready to move to a new location, all of the accessories can be placed on the unit and moved at the same time. This unit has capacity to operate two lines of 1½-in. diameter hose of different lengths simultaneously, or one 2-in. hose.

Atlas 6-In. Precision Backgeared Bench Lathe

Available with 12 or 18 in. capacity between centers, the small backgeared, screw-cuting bench lathe announced by Atlas Press Co., Kalamazoo, Mich., will swing diameters up to 6 in. The adjustable countershaft is mounted at the rear of the headstock and V-belts are used from motor to countershaft and from countershaft to headstock. Timken tapered roller bearings are used for the headstock spindle while carriage bearing, tailstock bearing and cross-slide and tool post dovetails have gibs or laminated shims to take up adjustment in order to maintain accuracy. Tailstock ram is graduated. Motor reversing switch is mounted within easy reach of the operator and is fitted with a knobbed lever control. Belt tension is controlled by a conveniently placed lever.

Specifications: swing over bed, 6 in.; swing over carriage, 4⅛ in.;

OK'd BY ADOPTION!

Lathe Manufacturers are not easy to enthuse. But when one by one they adopt the standard Spindle Nose . . . there must be a reason.

because of these

EXCLUSIVE FEATURES

★ No back-off hazard at high speeds or sudden stops. The safety key securely locks the chuck. Absolute safety for modern production.

★ Chucks can be mounted to run true on both diameter and face within very close limits. Accuracy is retained indefinitely because the bearing surface is not subject to wear.

★ But 12 to 15 seconds required to mount or demount face plate or chuck. No locking of gears or pounding to remove face plate or chuck. Key in spindle accurately positions chucks or plates on the spindle. The sliding is on the key, not on the taper. Operator can use both hands to start and tighten the collar.

★ Immediate alignment of collar thread with face plate by means of the key in the spindle. No jockeying.

★ Only three sizes of chucks and face plates required for all sizes of lathes 12" to 36". Chucks interchangeable on all machines.

★ No bearing parts to wear. Easy to clean. Less overhang.

And the reason is fast becoming universal

For many years the threaded or flange spindle nose represented a serious drawback to speedy production, operation safety, continuous accuracy and quicker, more convenient chuck changing.

Then came the standard Spindle Nose . . . the greatest advance in Spindle Nose design in 50 years. At one stroke it gave safety to high speeds and sudden stops — ease in handling — speed to production — saving to labor — longer life and the elimination of expensive chuck inventories.

Its adoption by many lathe manufacturers and its wide acceptance by industry is an OK that will give pause to a purchase which lacks this feature.

Get the Facts — Compare Them

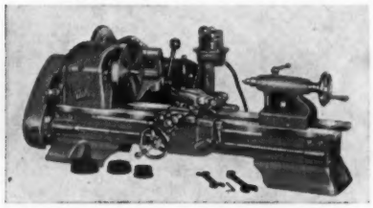
The standard Spindle Nose is standard equipment on all LeBlond Lathes and a host of other lathes.

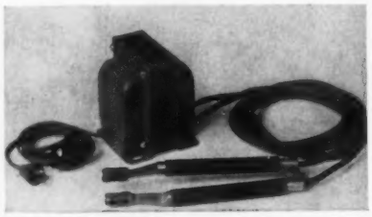
The complete story is worth your writing.

THE R. K. LeBLOND MACHINE TOOL CO.

CINCINNATI, OHIO

number of spindle speeds, 16; spindle speed range, 54 to 3,225 r.p.m.; thread cutting range, 8 to 96, right or left hand; feed per spindle revolution, 0.0026, 0.0042, 0.0052 or 0.0083 in.; hole through headstock spindle, 17/32 in.; Morse taper in spindle nose, No. 2; cross feed travel, 3⅜ in.; tool post slide travel, 1¾ in.; tool post swivel graduated 0 to 90 deg. right and left; tailstock ram travel, 1¼ in.; tailstock setover, 9/16 in.; over-all length for 12 in. between centers unit, 26½ in.; over-all length for 18-in. between centers unit, 32½ in.; motor required, ¼ hp. Weight of complete machine, less motor, 90 or 98 lb. depending on bed length selected.





Ideal No. 2 "Midget" Thermo-Grip Pliers

Designed to handle small soldering jobs in restricted spaces, the No. 2 "Midget" Thermo-Grip electric pliers offered by Ideal Commutator Dresser Co., 1439 Park Ave., Sycamore, Ill., may be used satisfactorily in sweating joints on small copper pipe and tubing up to ⅜ in. in diameter. These pliers are hinged at the end, allowing for increased flexibility, sensitive pressure and ease of handling. Secondary leads are passed through the hollow hinge casting and through the fiber handles to the point where they are fastened into the jaw castings.

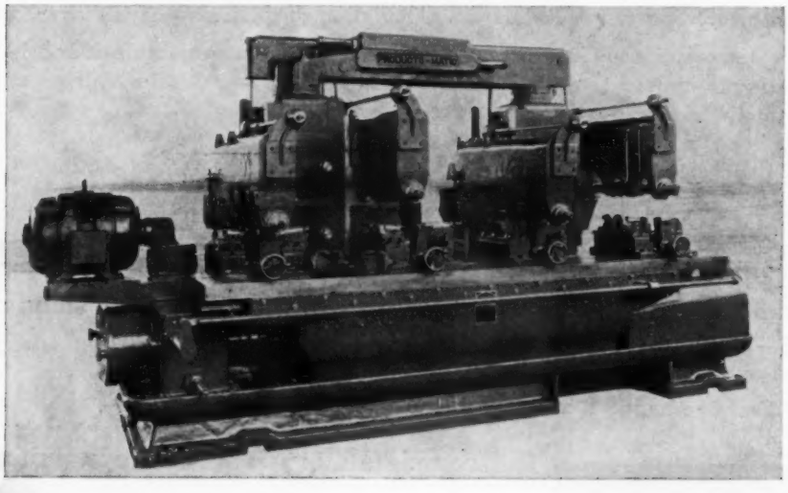
Producto-Matic No. 130 Bed-Type Milling Machine

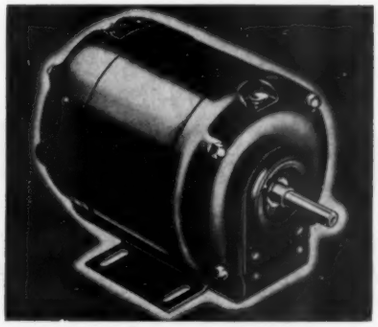
The No. 130 Producto-Matic milling machine is a full-automatic, cam-operated unit in which four separate cutter arbors move vertically. Offered by the Producto Machine Co., Bridgeport, Conn., this machine has four separate stations or work fixtures, each being directly under one group of cutters. The table also moves longitudinally, all movements being synchronized and automatically operated from cams. Work fixtures are positioned so that two are in the milling position, while two are in the loading position at any one time. Thus, two groups of work are being milled and two are being loaded simultaneously.

In the set-up shown, the first and third cutter arbors, reading from left to right, are in the milling position, while in the second and fourth the cutters up, out of the way, for convenience in loading and unloading the fixtures. Each of the two vertical columns connected by a bridge, support two heavy-duty cutter spindle assemblies having worm and worm gear drives. Within each column are cam drums controlling the vertical movement of the cutters. Each cutter spindle assembly is counterbalanced by means of chain and springs. An automatic start and stop mechanism is used to permit easy loading and unloading without risk of the operator being injured.

The action of the machine consists of two of the cutter spindle assemblies feeding down to proper depth of cut and to a positive stop. The table then automatically travels longitudinally for the required length of cut. When this cut has been taken, the cutters rise out of the work and the trip mechanism stops the rotating cutters. The table moves back to position for milling the second group when the cutters have stopped.

Operator has full control of the machine at any point by means of the starting lever. Different lengths of table travel are obtained by means of a drum cam which is easily removed from the end of the large drive shaft on the right side of the machine. Drive is from a 15-hp. motor through the transmission gearbox, using change gears for feed and speed changes. Specifications: over-all length of base, 140 in.; width of base, 48 in.; total weight of machine, 30,000 lb.; vertical travel of cutters, 8 in.; longitudinal travel of table, 16 in.

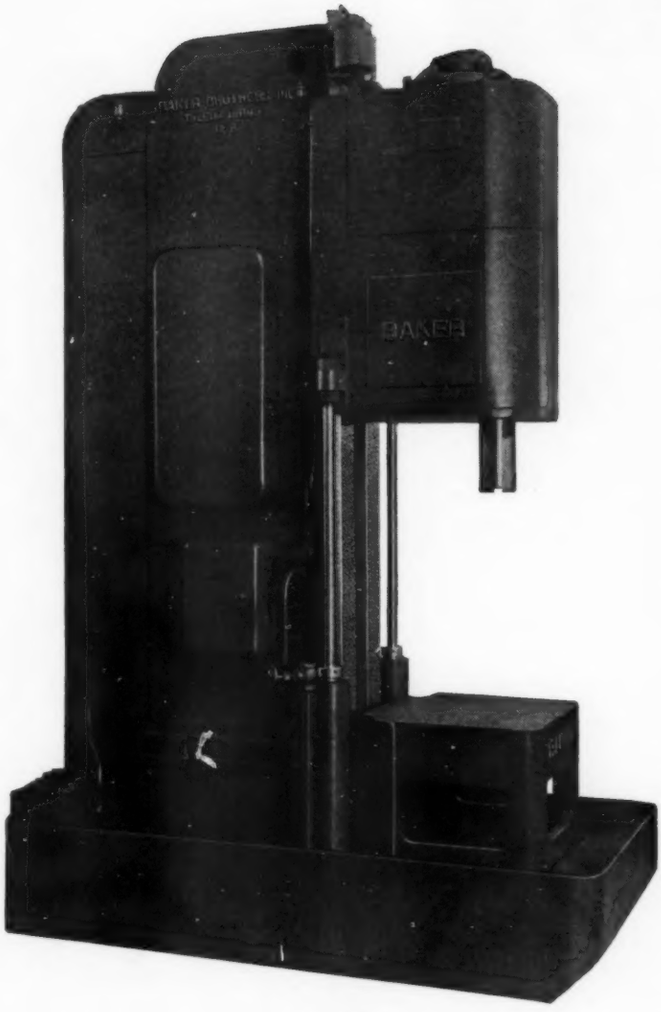




Ohio Resilient-Mounted Small Electric Motors

Available either with a standard solid base with resilient mounting, as shown, or with a special resilient, belt-tightening mounting, the fractional-horsepower motors offered by The Ohio Electric Mfg. Co., 5914 Maurice Ave., Cleveland, Ohio, are made in sizes ranging from ½ to 1/3 hp. Standard sizes are available for 900, 1,200, 1,800 and 3,600 r.p.m. Split-phase or capacitor types are also available for two-speed operation. The belt-tightening type motors are so mounted that the weight of the motor provides the initial belt-tightening effect.

Details Count



30 HO
capacity up to 25 H.P.
max. feed pressure 23,500

Carefully considered details of Baker machines are the basis for their better production performance.

The standard 30 HO hydraulic feed machine (illustrated) shows the usual sound Baker design. Important details that insure accuracy, speed and long life are also included. Automatic lubrication, helical gears in head, multiple splined spindle mounted on preloaded ball bearings, patented "Twin Pull" feed, and lower drive to spindle—these are not necessary for an ordinary machine. They are, however, required to meet Baker performance standards.

The 30 HO is provided with pick off gears for speed changes; is totally enclosed for safety and easy maintenance; and can be furnished with multiple head, indexing table and special fixtures for special requirements. It is one size of a complete range of standard machines.

For your drilling, boring, tapping, and reaming requirements, consider machines built for better performance. Submit a blueprint or sample part for a recommendation by our engineering department.

BAKER BROTHERS, Inc., Toledo, O.
Newark, N. J. office 1060 Broad St.

★ BAKER ★

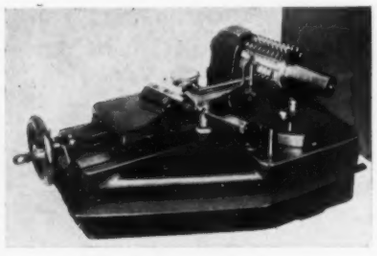
Pettinos "Sonittep" High-Temperature Cement

Finely ground to permit thin joints, "Sonittep" high-temperature cement, offered by George F. Pettinos, Inc., 1206 Locust St., Philadelphia, Pa., has been improved so that it will withstand any condition where firebrick is applicable. The temperature range has been increased so that it is now recommended for use with high-grade firebrick to temperature of 2,900 F. This material is ready to use as it comes from the container and air-sets hard and provides strong joints from room temperature to its fusing point. It is claimed to bond the entire wall from the hot face to the cold face and overcome troubles due to shrinkage, cracks or corrosion.

Michigan Hob Contour Checker

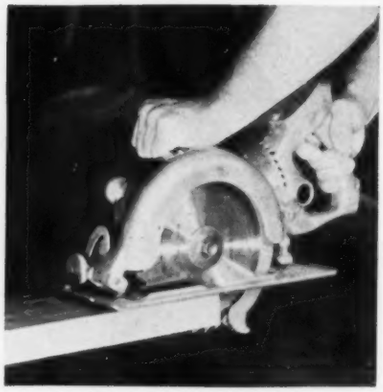
Michigan Tool Co., 7171 E. McNichols Road, Detroit, Mich., offer this improved hob contour checker for toolroom and gear laboratory use. It is designed for checking hobs to locate possible sources of gear errors. It is claimed that the instrument shows any deviations from true pressure angle, down to 0.0001 in. Interchangeable angle blocks are not required for checking hobs of different pressure angles. A sine-bar setting is provided to take care of these different pressure angles.

The indicator is provided with a multiplication of five to one, so that a movement of the contact finger of 0.0002 in. will register a travel normally representing 0.001 on the indicator. This is said to enable the registration of depressions and elevations caused by rough grinding. A sheet metal cover is provided to protect the instrument against dust.



Morse Tipped Reamers

A line of cemented-carbide tipped reamers in expansion and solid types has been announced by The Morse Tool Co., Detroit, Mich. Standard sizes, with either straight or taper shanks, are available.



Black & Decker 7-In. Portable Electric Saw

This 7-in. portable electric saw, announced by The Black & Decker Mfg. Co., Towson, Md., has a $2\frac{3}{8}$-in. maximum depth of cut. Depth can be adjusted and set at any point up to maximum. The close-coupled design is claimed to reduce weight and length, resulting in a compact balanced unit. Saw table may be tilted for angle or bevel cutting and locked at any angle from 0 to 45 deg. A detachable and adjustable rip-fence guides rip-cutting up to 6 in. wide. A sight notch at the front of the table permits following a marked line. Over-all length is $17\frac{1}{2}$ in.

Milburn "Hollow Air" Spray Gun Head

The "Hollow Air" atomizer head or air cap for paint spray guns announced by the Alexander Milburn Co., 1416 W. Baltimore St., Baltimore, Md., is claimed to atomize synthetic enamels, paints and lacquers. Hollow jets of air made possible by this air cap, are claimed to provide finer and wider sprays than have been possible heretofore. Working with the gun at a normal distance of 6 to 10 in. from the work, satisfactory spray widths of 18 in. or more are said to be obtained. Large areas can be finished rapidly.

Porter-McLeod Higley-Type Swing-Frame Cold Metal Saw

The 8-in. "Higley-type" swing frame, up-feed type cold metal saw, offered by Porter-McLeod Machine Tool Co., Inc., Hatfield, Mass., is the first of a redesigned and modernized line of sawing machines being developed from the types formerly manufactured by Higley Machine Co. Drive is from a 5-hp. constant-speed motor through silent chain to a self-oiling, balanced friction clutch on the main-drive shaft, which operates at 300 r.p.m.

Feed is upward, through an elevating pinion and steel quadrant, and is controlled by a conveniently regulated, flat-faced friction, giving blade protection against unexpected cutting resistance. The upward feed is claimed to eliminate tooth damage due to blade riding on or dropping against material and provides for power feed pressure only, without added gravity load.

The machine shown is equipped with standard clamping equipment for manual operation. Complete hydraulic clamping fixtures can be supplied. A short-end cutting fixture for multiple or single bars is also available. This fixture will clamp the work on both sides of the blade and produce pieces practically free of burrs to close limits. Manual or power-driven feed tables are available for long bars, as are a variety of stationary or adjustable gage stops. Blade travel may be set for any desired upward cut of saw and return is by gravity.

MAKING GOOD WHEREVER INSTALLED

Salvaging rusted bolts in large midwestern railway shop

● NEWEST machine in its class, the Rapiduction has already forced its way to the front. Fast, accurate and easy to set up for standard or special jobs, it will handle bolts, staybolts, anchor bolts, tie rods, jackscrews, vise screws, steering rod knuckles, heavy cap screws, hooks and eyes, pipe, nipples or what have you. Capacity, ½" to 2¼", or ⅜" to 1½", in both single spindle and double spindle types. Spindle speeds, 32 to 298 R. P. M.

● The first purchasers of Rapiduction Bolt Threaders bought on recognition of sound engineering and faith in the OSTER-WILLIAMS reputation. Today the orders are based on demonstrated superiority of performance. Before buying any production bolt threader get the RAPIDUCTION facts. Write

THE OSTER MANUFACTURING COMPANY

Sales Office: 2049 East 61st Street, Cleveland, Ohio

Factories: Erie, Penna., and Cleveland, Ohio

New York City Showroom and Office: 292 Lafayette Street

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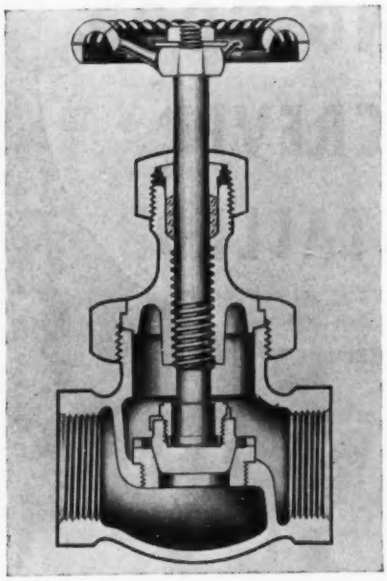
THREADING HEADQUARTERS SINCE 1893

OSTER THREADING EQUIPMENT WILLIAMS

RAPIDUCTION BOLT THREADER

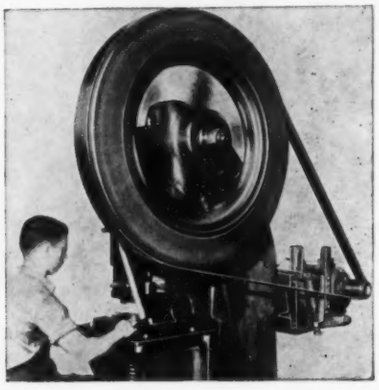


Crane Plug-Type Small Valves

Designed for use on small lines carrying steam, hot water, cold water, oil, gas and similar fluids, the No. 14½P brass globe valves and No. 16½P angle valves announced by Crane Co., 836 S. Michigan Ave., Chicago, Ill., have nickel-alloy, plug-type disks and Exelloy body-seat rings. This combination of metals is claimed to have good resistance to wear, temperature, galling and scoring. These valves are made in sizes from ⅛ to 3 in. and are recommended for 300 lb. per sq. in. working pressure on cold water, oil or gas lines and 150 lb. per sq. in. steam working pressure.

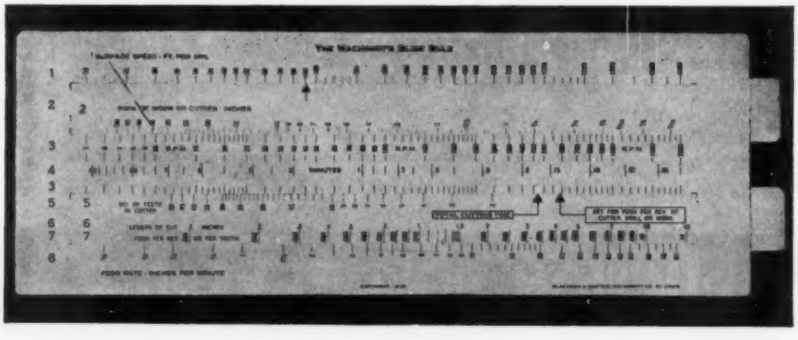
Blackman Machinist's "Shop Calculator"

Blackman & Nuetzel Machinery Co., 3713 Washington Ave., St. Louis, Mo., announce improvements in the celluloid vest pocket shop calculator previously described (*A. M.*—Vol. 76, page 1079). Known as the "Machinist's Slide Rule", this calculator is a specially graduated slide rule that will determine directly in one setting of the slides the proper speeds based on diameter of work, cutter and material. It will also calculate feeds per tooth and per revolution as well as feed per minute and total cutting time. Approximate horsepower required in turning, boring, drilling and milling operations can be determined. It also has the engineer's slide rule *A* and *B* scales.



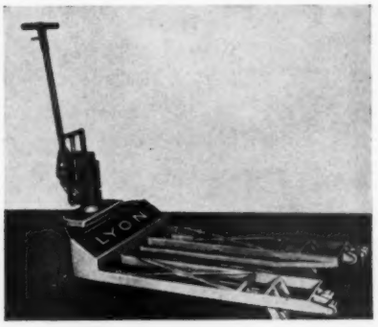
Rockwood Fiber Split Lagging

Used to increase the diameter of pulleys and flywheels, a fiber lagging having an improved clamp is announced by Rockwood Mfg. Co., 1801-2001 English Ave., Indianapolis, Ind. Made of the same material as Rockwood paper pulleys, these laggings present a compressed end-grain fiber surface to the belt that is claimed to grip and pull the belt without slip. In the smaller sizes, lagging must be at least 4 in. larger than the pulley on which it is to be applied, giving a minimum thickness of 2 in. for the lagging. As the size of the lagging increases, the thickness must be increased in proportion, so that at the 72-in. maximum diameter, the lagging is at least 6 in. thick or 12 in. larger in diameter than the pulley.



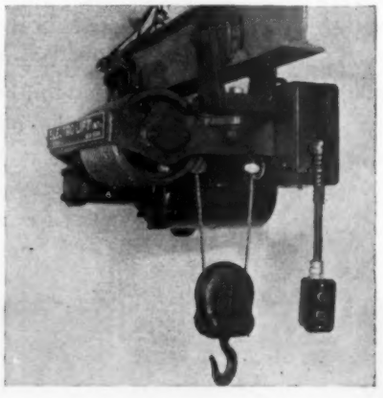
Lyon Pallet-Type Hydraulic Lift-Truck

Designed primarily for double faced pallets, this hydraulic lift truck, announced by Lyon Iron Works, Greene, N. Y., will handle double-faced pallets at times when a power truck is not immediately available and where space does not permit its use. On the rear of the lift truck platform are mounted two sets of rollers to facilitate the entrance of the truck into the pallet. These rollers when they contact the bottom boards, raise the rear end of the truck frame thus allowing the wheels to easily enter the pallet. The truck shown has 4,000 lb. capacity, a lowered height of 3¼ in. width with a 3 in. elevation. Over-all length of the U-shaped carrying platform, including the rollers, is 48 in. Width is 30 in. Other sizes can be furnished.



Electro Lift "Rope-Guide" Hoist

Designed especially for side and end pulling where loads cannot be brought directly under the hoist, the "Rope-Guide" hoist announced by Electro Lift, Inc., 30 Church St., New York, N. Y., has a drum with deep grooving. Cable is completely submerged within the grooves. This hoist unit is fitted with a traveling

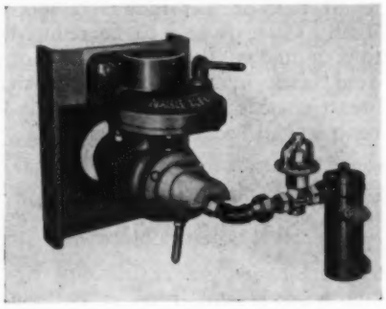


guide having a finger which runs in the groove ahead of the cable, holding the cable in its proper groove. The hazard of crossed or piled up cables is said to be eliminated, thus increasing cable life and reducing cable breakage.

These hoists are available in sizes ranging from ¼ to 5 tons and have all the speeds and ratings of standard hoists. They have a worm drive. Single- and twin-hook types are available, the latter being particularly suitable for handling long loads. Control may be either rope or pushbutton type. Top and bottom limit switches also may be provided.

Brown & Sharpe No. 206 Centrifugal Pump

Centrifugal motor-pump No. 206, announced by Brown & Sharpe Mfg. Co., Providence, R.I., is claimed to be particularly suited for supplying coolant to machine tools, light machinery and for use where dirt or abrasives may be present in the liquid. It is designed for a moderate volume of flow at a low head. This pump is fitted with a fully inclosed motor having grease-sealed ball bearings. Stainless-steel shaft is integral with the motor and the aluminum-bronze impeller is of the open- or non-clogging type. Discharge pipe clears the motor. This unit is designed to be mounted in a tank with a maximum depth of submersion indicated by the water line mark on the casing. Discharge connection is machined to take a ¾-in. diameter standard pipe.



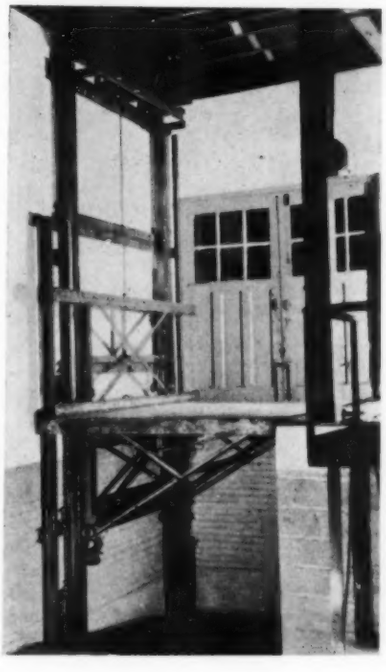
"Mahr" Atomizing Oil or Gas Burner

Using either oil or gas, the triple atomizing burners announced by Mahr Mfg. Co., Minneapolis, Minn., are suitable for forging, welding and heat-treating furnaces. They are designed for operation with air pressures ranging from 10 to 14 oz. per sq. in.

Fuel passes over three separate atomizing surfaces, causing fine atomization and thorough mixing. When low pressure gas is used as fuel, a special gas unit is installed in place of the oil unit.

"Wallclimber" Freight Elevator

The "Wallclimber" two-level freight elevator offered by Revolvator Co., State St. at Bergen Turnpike, North Bergen, N. J., is said to be suitable for lifts up to 12 ft. Capacities range to 5,000 lb. and car size to 7 x 10 ft. The accompanying illustration,



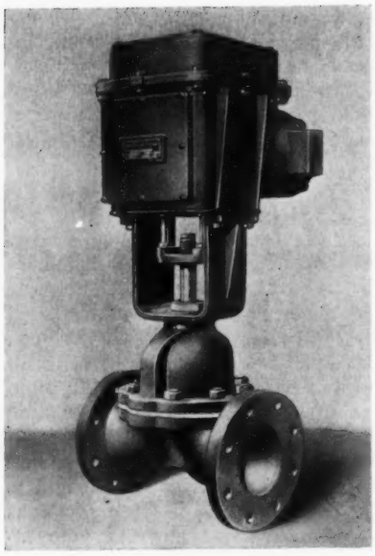
taken during installation, shows details of the standard 4,000 lb. capacity unit with a 78 x 118 in. platform. This unit requires a 90 x 120 in. shaftway. Rails, cables and counterweights use 11 in. of shaft space.

Rockwell Pump

Designed to empty metal oil barrels by inserting through the large side bung hole, this barrel pump offered by The Stanley P. Rockwell Co., Inc., 296 Homestead Ave., Hartford, Conn., has a capacity ranging from 10 to 20 gal. per min., depending upon the viscosity of the oil. Standard motors are wound for 110-volt service, either a.c. or d.c. Length is 31 in. and weight is 11 lb. Outlet is tapped for 1-in. standard pipe fittings.

M. & W. Perspiration-Proof Industrial Lacquer

Maas & Waldstein Co., 438 Riverside Ave., Newark, N. J., offers a clear lacquer that is resistant to perspiration. This lacquer is applied by dipping or spraying and air-dries out of dust rapidly. After hardening for a few days, it becomes practically insoluble and resistant to moisture, soap and water, including perspiration. Used on steel products, this lacquer is claimed to provide a high degree of protection against rusting. It is also supplied in grades suitable for finishing copper, brass and aluminum.



A.T.C. Model C, Type 1 Valve Mechanism

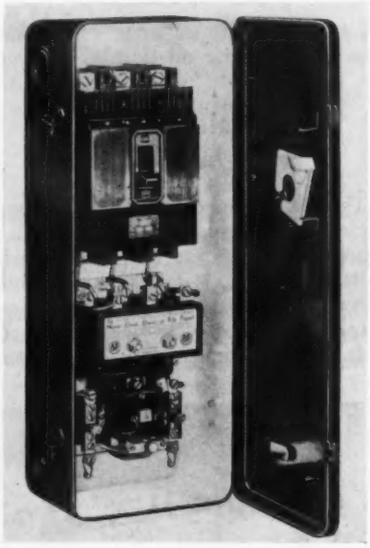
Listed as Model C, this Type 1 motor valve mechanism offered by Automatic Temperature Control Co., Inc., 34 East Logan St., Philadelphia, Pa., is designed to operate slip-stem valves for heavy pressures in the larger sizes. The mechanism shown exerts an opening and closing force on the valve stem of 2,000 lb. with 5 in. per min. movement and 2½ in. stroke. Strokes up to 10 in. and speeds of 3 to 10 in. per min. are available, with corresponding changes in power.

Benjamin Intensifier

Designed to supplement general illumination, this lighting intensifier offered by Benjamin Electric Mfg. Co., 120-128 S. Sangamon St., Des Plaines, Ill., is capable of building up approximately 1,000-footcandles of lighting over restricted areas of vertical or horizontal surfaces. An angular adjustment feature is an integral part of this industrial spotlight. Glare is said to be reduced to a minimum through the use of dead black internal louvres, which are removable when a less highly-concentrated beam is desired.

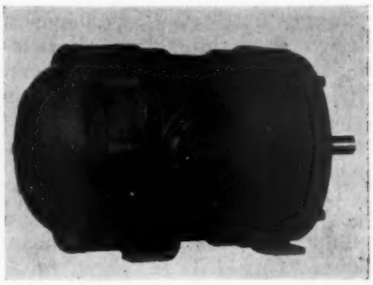
A-B Combination Starting Switch

A combination starter utilizing circuit breakers and listed as Bulletin 713 has been developed by the Allen-Bradley Co., 1311 S. First St., Milwaukee, Wis. These units have a maximum rating of 30 hp., 220 volts; 50 hp., 440-550 volts. Automatic starting switch is of the solenoid type, with double-break silver-alloy contacts and two thermal overload relays. Circuit breaker is inclosed in a molded bakelite case and has three poles operated by a single lever. It can be tripped open or closed in the same manner as an ordinary disconnect switch.



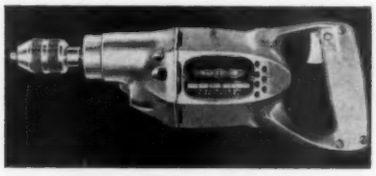
Reliance Explosion-Proof Motors

Type AA explosion-proof, squirrel-cage a.c. motors announced by The Reliance Electric & Engineering Co., 1042-1090 Ivanhoe Road, Cleveland, Ohio, have mounting dimensions conforming to N.E.M.A. standards. These motors have been tested and approved by the Underwriters' Laboratories for Class 1 Group D hazardous locations, which include those in which flammable volatile liquids, highly flammable gases, mixtures or other highly flammable substances are made, used or stored, in other than the original containers. Construction of these motors is such that all working parts are completely inclosed and the housing is claimed to be strong enough to withstand an internal explosion without bursting, or loosening the joints.



Black & Decker ¼-In. Low-Speed Drill

The ¼-in. low-speed drill announced by The Black & Decker Mfg. Co., Towson, Md., has been designed for use in drilling stainless steel, monel and other hard metals. Specifications: capacity in steel, ¼ in.; capacity in hardwood, ½-in. no-load speed, 450 r.p.m.; full-load speed, 285 r.p.m.; over-all length, 13 in.; net weight, 6¼ lb.



Benjamin Combination Industrial Lamp Units

This dome-type combination unit uses an arrangement of three 150-200 watt incandescent lamps around a central 400-watt mercury lamp to produce a light that is claimed to be visually comfortable and to blend well with daylight. Offered by Benjamin Electric Mfg. Co., 120-128 S. Sangamon St., Des Plaines, Ill., this unit has a ventilated reflector of porcelain enameled steel to provide wide, even distribution of light on both horizontal and vertical surfaces.

What Should a Modern 30-In. Lathe Be?

J. A. PHELPS
The Motch & Merryweather Machinery Company

The interesting part of A. W. Forbes' article on this subject (*AM*—Vol. 81, page 1177) is that he does not attempt to present technical or engineering data to support any pet theories. Instead he asks common-sense questions.

Engineers and designers are likely to think along conventional lines and concentrate on perfecting some existing gadget or construction and thus entirely miss some obvious and practical development. More articles like the one referred to should be valuable for all designers and create discussions from which some worthwhile ideas would develop.

Mr. Forbes mentions, as one of the important points, the matter of getting the piece into the lathe. We take it for granted that the operator uses the traveling crane or a jib crane, or a hoist of some kind attached to the lathe. We have always done it that way. But, must it be done that way? This is a good point to think about.

The discussion regarding automatic stops makes one wonder if the machine tool salesmen are doing a good job after all. Automatic stops have been supplied on lathes for years as part of manufacturing lathe equipment. These stops are added to the standard lathe for a moderate extra cost, and automatically throw out the feed at any desired point. Here is a good thought for the salesman—don't expect the customer to guess about attachments and devices—tell him about them.

ARTHUR SILVESTER

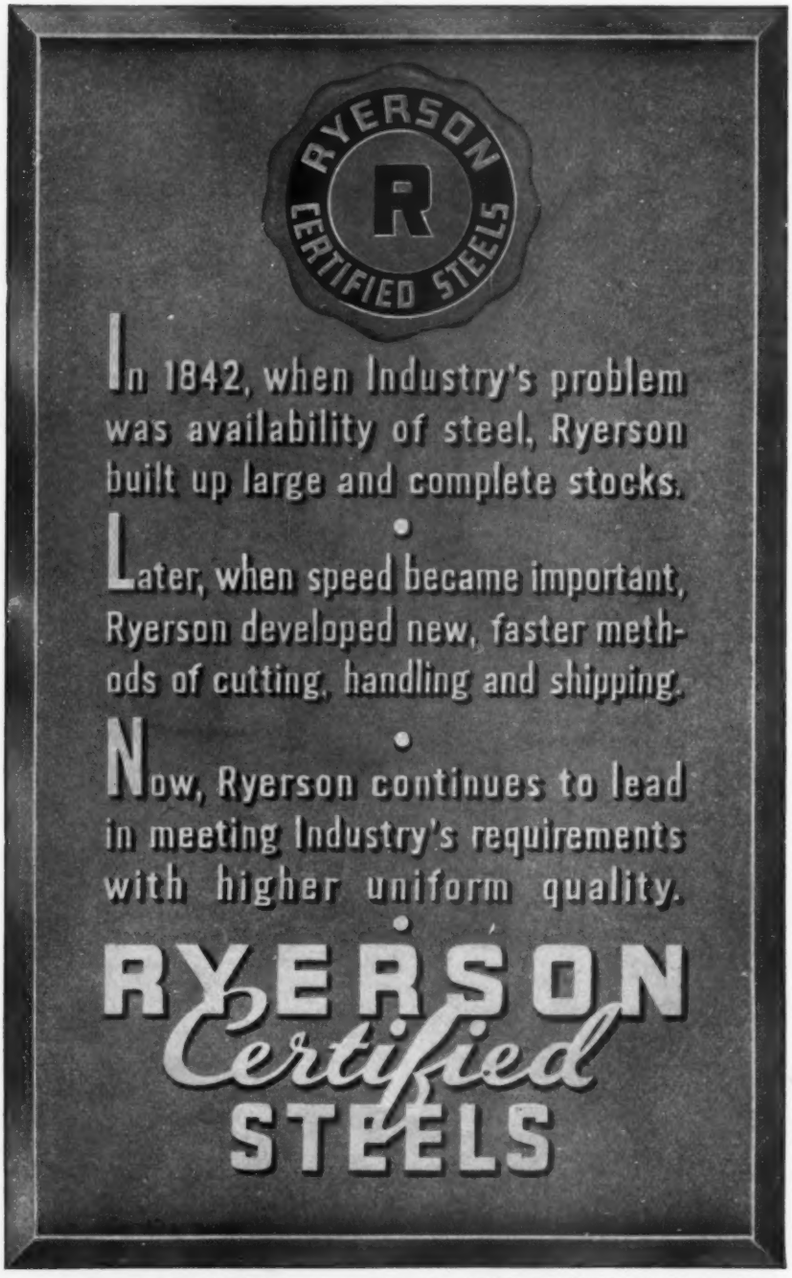
With years of experience on lathes of similar size, I can clearly see the problem advanced by A. W. Forbes (*AM*—Vol. 81, page 1177). I believe, as Mr. Forbes apparently does, that far too much importance is placed on the value of high speeds and feeds on the modern lathe, and the savings accomplished therefrom. It is a fact that many of the feeds and speeds in the modern lathe are never used, and in a number of plants a lot of the new gadgets on the latest-type lathes are seldom employed. But I do not think that Mr. Forbes' suggestion for some sort of specialized equipment in the way of an adjustable clamp to be attached to the carriage or bed will ever be adopted for these reasons:

1. Many heavy lathes are arranged along the sides of shops, and the work is generally put in the lathe from the front. With Mr. Forbes' suggestion all work would have to be put in from the back, which is not convenient in my judgment. Clamps would have to be adjusted not only to take various diameters on shafts or similar work, but also for a forging with much different diameters at the ends.

2. The method would be no use at all on odd-shaped pieces.

3. There would have to be some kind of flexible adjustment possible after the piece had been lifted approximately to position, in order to enable the tailstock center to locate easily. A clamp would not hold a rough shaft in alignment and, the clamp being rigid, the shaft could not be swung like it can with the present method of using a chain or rope sling.

4. The method proposed would add considerable weight to the carriage, causing extra wear on the lathe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bed unless balanced in some way. Pieces of work up to 1,000 lb. are often machined in lathes of this size.

5. There must still be some method of bringing the piece to the lathe and taking it, when finished, to assembly. Either a traveling crane or a portable hoist must still be used.

With regard to automatic stops suggested by Mr. Forbes, these could be for correct travel distance, thus presumably allowing the operator to work on some other job. There is some merit in this suggestion, but on a shaft or similar piece of work a prudent workman will return to the machine and check the size and parallelism.

Mr. Forbes criticizes the tool holder position. It is admitted that the toolbox almost hides the cutting tool through being directly in front of the operator and between him and the work. But if it must be moved to another position, another disadvantage appears, for example, when it is necessary to use a traveling stay on a thin shaft or similar work. The present position is the only place where the tool can be put to greatest advantage. This is also true when boring work in chuck or faceplate operations. Much experimental work has been carried out by machine tool builders that has resulted in the present position of the tool box.

In conclusion, is it not possible to design a lathe to take 30 in. in diameter between centers and still be very little heavier than the present model of that rating? Could not that portion of the bed on which the carriage and tailstock are located be set down to overcome interference of the carriage that at present prevents a 30 in. piece of work being machined on centers? I have seen a lathe similar to this design. Of course, the height of the tool box and the tailstock would have to be increased, and there would also have to be a change in the distance between the gears on the leadscrew and the lathe spindle.

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Engineering for Production in Stainless Steel

The development of any one new industry is usually divided into three distinct periods. Each has its own characteristic feature. The three features for the three different periods are: men, methods and materials.

The first period depends entirely on the men who initiate the business and build it up around their several personalities which are in turn reflected in the product. This is fashioned by a few craftsmen, using the methods and materials best suited to their skill rather than, perhaps, to the product itself.

If the product finds favor the business enters the second period of development. This is one of expansion where personalities no longer suffice and must be supplemented by the introduction of methods. During this time the chief difficulty lies in adapting the methods to an ever fluctuating rate of production. So, just as the first period must be looked upon as an investment in men, the second period must be regarded as an investment in methods. When men and methods have been stabilized the business can progress into the third and final period of its development.

The third period has been designated as being one of materials. This is not strictly true, for refinements are indicated in every department of the business and not in materials

alone. It is true, however, that with the previous concentration on promotion and processes the material question has been somewhat neglected. This attitude changes as soon as it is realized what effect material has upon production, cost and competition. Four factors must be taken into account in this third stage of the business.

1. A possible lower cost of materials;
2. A material better suited to the methods of larger scale production;
3. A material calculated to improve the product, especially in competitive fields;
4. A material which is more available against sudden demand.

The not infrequent result of such consideration has been the complete change in materials, with which business began. For instance, the automobile body gradually progressed from wood panels and patent leather fenders to all-steel construction.

Whenever a new material is adopted it has always involved new engineering. One can theoretically build just as strong and just as light with wood, the lighter alloys or high-tensile steel. The technique of application, however, differs as widely as, for instance, a wooden plank, a rolled section of aluminum or a steel girder, all carrying the same load.

Obviously the labor done in sawing a plank, or extruding an aluminum section or in fabricating a steel girder varies tremendously. It might be indicative if we could stop here, but we can't. Refinement steps in, production steps up, and the hand labor of working with wood may become far more expensive than the machine-like fabrication of steel.

When production engineering exhausts the possibilities of one material it seeks another. Today the production trend is strongly in favor of welding. A material which favors welding and at the same time meets high strength structural requirements is 18-8 stainless steel. In extremely light-weight constructions it must be used in very thin gages. To make strong structural members out of thin steel is one problem; to fabricate and assemble these into an equally strong structure is another.

The criterion of any thin gage structure is not the tensile or compressive strength of the materials but rather the stability of the walls of any section used. Tests have been made to establish the stability coefficient of flat surfaces having various widths and thicknesses. Buckling strength has been determined for various "flat-pitch ratios." This is the ratio between the flat width of any face of a column structure and its thickness.

For example, if a 2-in. square tube has a wall thickness of 0.05 inches, the flat-pitch ratio is 40. Tests show that the walls of this tube will buckle or otherwise become unstable when the pressure reaches 40 per cent of the tensile strength of the metal. If, however, a deep stiffening bead is rolled down the middle of each side of the tube the flat-pitch ratio becomes 20 and its instability will not manifest itself until the stress in compression becomes 83 per cent of the tensile strength.

No mention is made of the stiffening effect of curvature. This is because any parts with curvature introduce problems in final assembly. There is no point in making strong individual members which cannot be joined later into an

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Bulletin No. 11-C illustrates, describes and prices the different models of the 11-inch lathe. Copy sent free, upon request.

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equally strong structure. Flat surfaces favor an efficient joining. Furthermore, they can be narrowed or beaded so as to approach very closely the stability of a round tube.

The above facts are quite important in the designing for stainless steel. Structural members should be designed about the joints rather than to have the joints designed to fit the members. It is the joints that will determine whether the assembly is going to be a success in production. For instance, the gas welded joints of a tubular airplane fuselage constitutes a production limit. There is a limit of time, a limit of skill and a material limitation which cannot be improved regardless of the quality involved. Therefore, we can regard the use of flat sided sections rather than round or curved ones and the corresponding gussetted connections as the first step towards engineering for production.

It was recognized that stainless steel would automatically involve more complicated shapes, but it was also recognized that this same material invited assembly by point welding and that this in turn was reducible to the best shop practice.

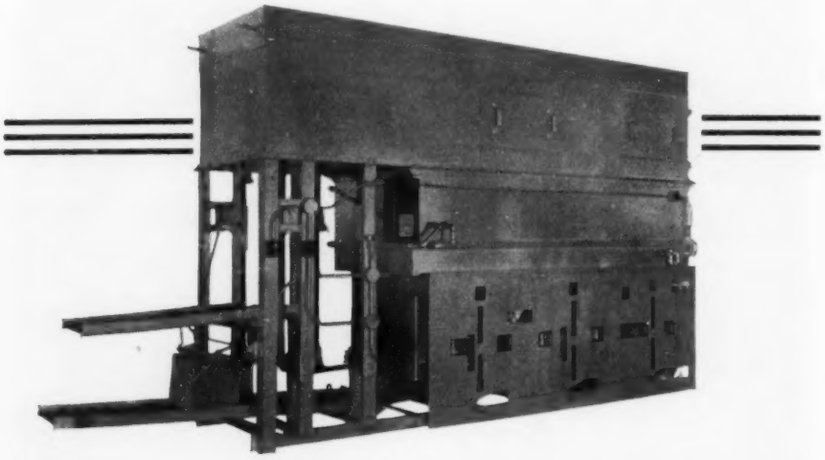
When some 40 welds can be made in the same time as is required to drive one rivet, when these welds are more efficient than a rivet and yet cost nothing for material and when the element of personal skill is eliminated, it will be appreciated that complexity in structure can be more obvious than real. This however does not excuse the production engineer from continued effort for simplification.

Not infrequently does the design engineer have fixed ideas which are incorrect or exaggerated. For instance, it is generally true that a closed section is more efficient than an open one. However, it costs money to fabricate a closed section as against an open one.

At first, the side posts of our railway cars were made of U-shaped sections with a closing strip welded across the opening. Although the welding operation was automatic, there were 200 welds involved and more important yet, a certain set-up time. Through cooperation of design and production engineers, tests were then made of posts wherein the amount or metal used in the closing strip was added to the U-shaped section by making it of a thicker gage. The opening was then stabilized with strips welded across it at 4-in. intervals. These also served as attachment points for the outer sheathing. The new posts not only cost a third as much to fabricate but also reduced the labor of final assembly and were actually more effective members for the specific loads which might be imposed upon them. Further improvements followed through simplification in the attachment of a thousand and one fittings which go to complete a railway car.

It is these incidental fittings which are so often forgotten in the primary consideration of strength and weight. They are not susceptible to a refined scientific treatment nor do they intrigue the imagination of any design genius. Their development is left to almost anyone who cares to assume the responsibility. Yet it is these seemingly secondary elements which eventually may shape or distort the final design.

To provide a good perspective the finished product is divided into various departments which are in turn broken down into the various individual elements. Along side of each



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department and individual item is placed a number which represents its percentage of the total cost and of the total weight of the completed assembly. From such a list it becomes evident where refinements should first be attempted. The list also helps in gaining cooperation on the part of design personnel. Without it, each designer is likely to try to direct attention to the vagrancies in other departments. By the same token, danger lies in another phase in that the more dominant minded production people tend to over-ride even reasonable objections of the designer. In this, they may actually jeopardize the whole product for the sake of a few cents. Management must ever be alert against such possibilities, not only with reference to definite acts but chiefly in the selection of the proper personnel.

Definite figures on the construction of stainless steel rail cars are purposely withheld. They tend to becloud the issue, which is simply that the man-hours required to fabricate a single pound of stainless steel have been reduced by 80 per cent during the construction of 60 cars, few of which were alike. This evidences a cooperative spirit between design and production forces.

Of course, improved tools and jigs were used during the period covered, but with no reproduction of identical units, the jigs had to be flexible and therefore not particularly efficient. When the product finally does become standardized, the production engineer steps into his own province.

From an address by E. J. W. Ragsdale, chief engineer, Edward G. Budd Manufacturing Company, at the Aircraft Production meeting of the Society of Automotive Engineers.

Spot Welding of Copper-Base Alloy

In order to find out what scientific factors in spot welding copper-base alloys should be considered in the research laboratory, Dr. D. K. Crampton and J. J. Vreeland, of Chase Brass and Copper Company, first devised tests to reveal the difference between good and bad spot welds, and then made spot welds under a wide range of operating conditions. All the welds were made in sheets 0.036 in. thick using a standard 150-kva. spot welder equipped with $\frac{3}{16}$-in. electrodes made of copper-chromium alloy and fitted with electron-tube timing control and a balanced air-operated head.

It was found, first of all, that a torsion test was a marked improvement over the common ripping test for determining the quality of spot welds, and that a hydrostatic test of a spot welded shell provided excellent supplementary information. With these two tests as a criterion, it was then discovered that the most efficient welding conditions, such as electrode pressure and power consumption, varied widely from alloy to alloy. The most important factor affecting these variations was found to be the electric resistance of the contact between the two sheets to be welded.

The contact resistance is a matter for scientific determination in the research laboratory, particularly at the temperature and under the pressure conditions obtaining at the instant the sheets fuse together. Once the contact resistance has been measured accurately, it may be used in predicting the welded conditions under which the welding electrodes will stick to or penetrate too deeply

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into a given alloy. It has already been found that addition of silicon and manganese to copper alloys is advantageous in raising the contact resistance and lowering the power consumption. However, it will only be after the plant experiments have been supplemented by laboratory research that anything like a scientific understanding of the spot welding of copper base alloys will be possible.

From a paper presented before the eighteenth annual meeting of the American Welding Society.

PATENTS

December 7, 1937

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Machine for Producing Gears. Leonard O. Carlsen, Rochester, N. Y., assigned to Gleason Works, Rochester, N. Y. Patent 2,101,237.

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Sawing or Filing Machine. Ed C. Oliver, Adrian, Mich. Patent 2,101,507.

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Grinding Machine. Charles H. Amidon, Worcester, Mass., assigned to Norton Co., Worcester, Mass. Patent 2,101,787.

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Geared Motor. Walter P. Schmitter, Milwaukee, Wis., assigned to the Falk Corp., Milwaukee, Wis. Patent 2,101,515.

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Hydraulic Pump or Motor. Elek K. Benedek, Mount Gilhead, Ohio. Patents 2,101,729 and 2,101,730.

Hydraulic Machine. Elek K. Benedek, Bucyrus, Ohio. Patents 2,101,731 and 2,101,732.

Carriage Release for Lathes. Laurence Harrington Randall, Lakeland, Fla., assigned one-half to Anna M. Randall, Daytona Beach, Fla. Patent 2,101,754.

Cam Grinding Apparatus. Clarence J. Green, Worcester, Mass., assigned to Norton Co., Worcester, Mass. Patent 2,101,796.

Grinding Wheel Truing Apparatus. Carl G. Flygare and Herbert A. Silven, Worcester, Mass., assigned to Norton Co., Worcester, Mass. Patent 2,101,795.

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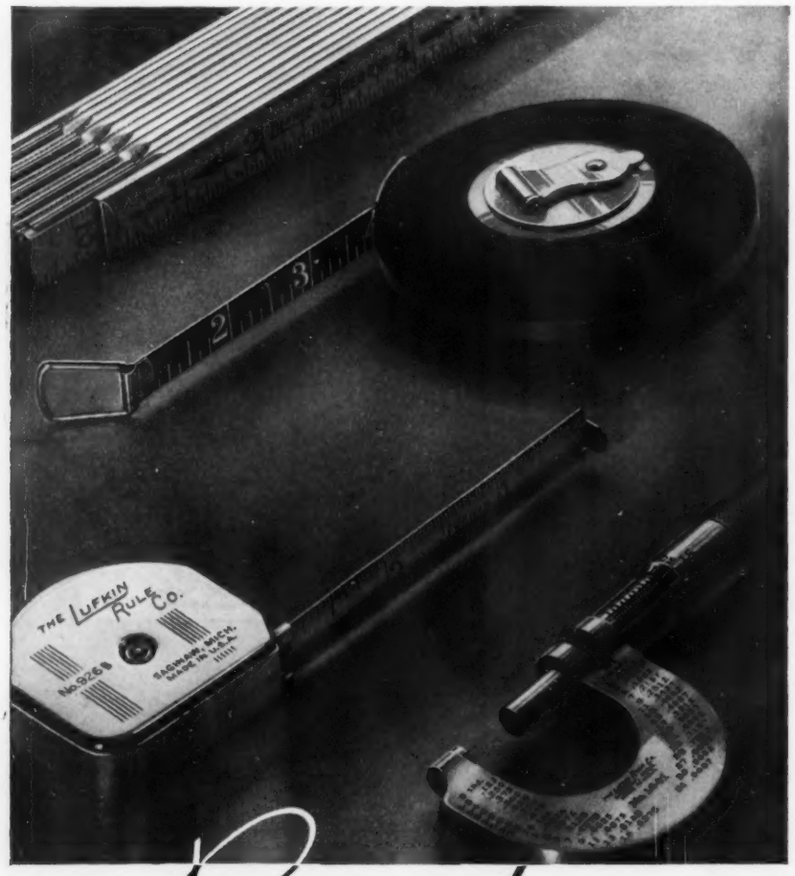
Molding Compositions and Process of Molding. Daniel E. Strain, Wilmington,



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Canadian Factory WINDSOR, ONT.

Del., assigned to E. I. du Pont de Nemours & Co., Wilmington, Del. Patent 2,101,107.

Method of Lubricating Bearing Surfaces. William Whitney Weinrich, Pittsburgh, Pa., assigned to Gulf Research and Development Co., Pittsburgh, Pa. Patent 2,101,632.

Electromagnetic Testing of Materials. Carl Kinsley, Westfield, N. J., assigned to United States Steel Corp., New York, N. Y. Patent 2,101,780.

Galvanizing Composition. Frank D. McBride, Philadelphia, Pa. Patent 2,101,816.

Tools and Accessories

Hydraulic Mold—for Plastics. Edward Anderson, Dayton, Ohio. Patent 2,101,015.

Inserted Blade Cutter. Frank P. Miller, Meadville, Pa. Patent 2,101,085.

Weld Efficiency Indicator. John P. Tarbox, Philadelphia, Pa., assigned to Edward G. Budd Mfg. Co., Philadelphia, Pa. Patent 2,101,108.

Lathe Tool Post. Joseph M. Redinger, Johnston, R. I. Patent 2,101,157.

Lathe Tool and Holder Therefor. Joseph M. Redinger, Johnston, R. I. Patent 2,101,158.

Spray Gun with Pneumatic Needle Valve Control. Svend Bramsen and Fritz Wahlin, Chicago, Ill., assigned to Binks Mfg. Co., Chicago, Ill. Patent 2,101,164.

Sanding Machine. Frans O. Albertson, Sioux City, Iowa, assigned to Albertson & Co., Inc., Sioux City, Iowa. Patent 2,101,305.

Tap. Willard C. Robinette, Pasadena, Calif. Patent 2,101,347.

Lathe Tool. Joseph Zackowitz Flushing, N. Y. Patent 2,101,379.

Adjustable Templet. Frederick Reich, Elizabeth, N. J. Patent 2,101,478.

Cutting Jig. Anthony S. Muller, Pontiac, Mich. Patent 2,101,624.

Indicator Gage. Harry W. Moore, Greene County, Ohio. Patent 2,101,718.

Wrench. Harvey H. Smith, Columbus, Ohio. Patent 2,101,760.

December 14, 1937

Metal-Working Machinery

Degreasing Apparatus. Clarence F. Dinley, Detroit, Mich., assigned to James H. Bell, Philadelphia, Pa. Patents 2,101,840 and 2,101,841.

Wire Cutting Machine. Marvin W. Lewis, Cleveland Heights, and Carl B. Jones, East Cleveland, Ohio, assigned to the Lewis Machine Co., Cleveland, Ohio. Patent 2,101,860.

Riveting Machine. Edward Turnquist, Anderson, Ind., assigned to General Motors Corp., Detroit, Mich. Patent 2,101,924.

Soldering Machine. Martin G. Boerger, Racine, Wis., assigned to Modine Mfg. Co., Racine, Wis. Patent 2,101,929.

Machine and Method for Forming Helical Springs. Raymond F. Carlberg, Grand Rapids, Mich. Patent 2,101,982.

Gear Broaching Machine and Method. William A. Hart, Detroit, Mich., assigned to Colonial Broach Co., Detroit, Mich. Patent 2,102,071.

Metalworking Machine, Lathe. Donald H. Montgomery, Berlin, Conn., assigned to the New Britain Machine Co., New Britain, Conn. Patent 2,102,183.

Chucking Machine. George O. Gridley, New Britain, Donald H. Montgomery, Hartford, and Earl H. Wheeler, New Britain, Conn., assigned to the New Britain Machine Co., New Britain, Conn. Patent 2,102,412.

Machine for the Tooling of Metallic Screw Propeller Blades. Charles William Berthiez, Paris, France, assigned to "Compagnie de Fives-Lille," Paris, France. Patent 2,102,505.

Grinding Machine. George Crompton, Jr., Flushing, N. Y., and Clarence J. Green, Worcester, Mass., assigned to Norton Co., Worcester, Mass. Patent 2,102,517.

Grinding Machine. Franklin E. Johnson, Worcester, Mass., assigned to Norton Co., Worcester, Mass. Patent 2,102,518.

Machine for Hobbing the Teeth of Worn Wheels. Gabriel Lechesne, Montreuil-sous-Bois, France, assigned to Paul Durand, Neuilly-sur-Seine, France. Patent 2,102,540.

Parts and Mechanisms

Speed Reducer and Other Transmission. George Holt Fraser, Brooklyn, N. Y. Patents 2,101,844 and 2,101,845.

Rotary Fluid Clutch. William N. Eddins, San Antonio, Tex. Patent 2,101,899.

Rail Chuck for Machine Tools. Theodore A. Wettig, Cincinnati, Ohio. Patent 2,101,926.

Centrifugal Clutch for Rotating Machine Elements. Gustaf Emil Jonsson, Huddinge, Sweden. Patent 2,101,946.

Clutch Control Device, Punch Press. Leon Saives, Billancourt, France, assigned to Louis Renault, Billaincourt, France. Patent 2,102,036.

Change Speed Mechanism. Franz Schmid, Lucerne, Switzerland. Patent 2,102,131.

Conveyor Feed Milling Machine. William Sinclair, Detroit, Mich., assigned to Production Engineering Co., Detroit, Mich. Patent 2,102,227.

Back Gauge for Punches. Charles V. St. Louis and George J Rundblad, Chicago, Ill, assigned to Wilson-Jones Co., Chicago, Ill. Patent 2,102,292.

Automatic Plating Conveyor. Burton G. Daw, Webster Groves, Mo. Patent 2,102,308.

Fastening Means for Bearing Sleeves. Frederick C. Morton, Eggertsville, N. Y. Patent 2,102,375.

Safety Mechanism, Punch Press. Jacob

for Results—

GENUINE OILGEAR

SURFACE BROACHING MACHINES

• To men familiar with the Oilgear Variable Delivery Pump—with the inherent advantages it offers over its many imitations, the application of that completely controllable and dependable flexible power unit to Surface Broaching needs can mean only one thing. Oilgear Surface Broaching Machines offer a smoothness of operation and dependable performance beyond comparison. For high production at close tolerances, with almost negligible maintenance, experienced shops insist on Oilgear. For full description of these remarkable Oilgear Surface Broaching Machines, write for Bulletin 23,000A. THE OILGEAR COMPANY, 1301 West Bruce Street, Milwaukee, Wisconsin.

- One or more pieces finish-broached simultaneously
- Highest production at close tolerances
- Each unit complete and self-contained
- Single lever, semi-automatic control
- Automatic full interlock of broach and shuttle tables
- Welded all-steel construction
- 6, 10, 16, 20 ton capacities

OILGEAR

SURFACE BROACHING MACHINES

Hoffman, Chicago, Ill., assigned to Willy Dumke, Chicago, Ill. Patent 2,102,557.

Belt Drive. Elmer G. Kimmich, Akron, Ohio, assigned to Wingfoot Corp. Wilmington, Del. Patent 2,102,560.

Safety Feed Knock-Out. Robert S. Brown, New Britain, Conn., assigned to the New Britain Machine Co., New Britain, Conn. Patent 2,102,567.

Processes

Method of and Apparatus for Coating Substances with Metals or Alloys. Charles F. Haunz, Buffalo, N. Y. Patent 2,101,854.

Preparing Metal for Enameling. George W. McGohan, Middletown, Ohio, assigned to the American Rolling Mill Co., Middletown, Ohio. Patent 2,101,950.

Method of and Apparatus for Hardening Gears. Leon D. Slade, Rochester, N. Y., assigned to Gleason Works, Rochester, N. Y. Patent 2,102,040.

Enlarging the Diameter of Hollow Metal Articles. Fritz Singer, Nuremberg, Germany, assigned to Tubus A. G., Glarus, Switzerland. Patent 2,102,099.

Magnetic Analysis. Theodor Zuschlag, Englewood, N. J., assigned to Magnetic Analysis Corp., Long Island, N. Y. Patents 2,102,450 and 2,102,451.

Method for the Production of Fan-Shaped Screw Locks. Adolf Thode, Hamburg-Billbrook, Germany, assigned to Illinois Tool Works, Chicago, Ill. Patent 2,102,493.

Tools and Accessories

Self-Gripping Mandrel. Elmer O. Goordman, New York, N. Y. Patent 2,101,846.

Welding Apparatus, Clamp. Clarence W. Hines, Chicago, Ill., assigned to Chicago Bridge & Iron Co., Chicago, Ill. Patent 2,101,856.

Sheet Metal Piston Manufacture, Forming Die. George M. Ambroslus, Lakewood, Ohio, assigned to the Standard Oil Co., Cleveland, Ohio. Patent 2,101,888.

Pyroelectric Tool, Saw. Edwin L. Meyer, Bridgeport, Conn. Patent 2,101,012.

Spraying Apparatus, Paraffin Gun. Ludwig Stoesling, Monrovia, Calif. Patent 2,101,922.

Carburizing Box. Angus M. Miller, Pleasant Ridge, Mich. Patent 2,102,019.

Soldering Iron. William R. Richardson, Roswell, N. Mex. Patent 2,102,032.

Grinding Device, Hone. George J. Batzer, Cleveland, Ohio, assigned to Micromatic Hone Corp., Michigan. Patent 2,102,053.

Abrading Tool, Hone. Thomas F. Quigley, Cleveland, Ohio, assigned to Micromatic Hone Corp., Michigan. Patents 2,102,092 and 2,102,093.

Tool Retainer for Portable Power Driven Tools. Joseph F. Haas, Forest Park, Ill., assigned to Wodack Electric Tool Corp., Chicago, Ill. Patent 2,102,264.

Spray Gun Valve. Svend Bramsen and Fritz Wahlin, Chicago, Ill., assigned to Binks Mfg. Co., Chicago, Ill. Patent 2,102,303.

Grinding Wheel. Kenneth F. Whitcomb and Herbert W. Wagner, Worcester, Mass., assigned to Norton Co., Worcester, Mass. Patent 2,102,343.

Spray Head. Harold A. Roselund, Toledo, Ohio, assigned to the De Vilbiss Co., Toledo, Ohio. Patent 2,102,382.

Metal Spraying Apparatus. Thomas G Valentine and Edward J. Brennan, San Diego, Calif. Patent 2,102,395.

Cutting Tool, Reamer. Frank P. Miller, Meadville, Pa. Patent 2,102,478.

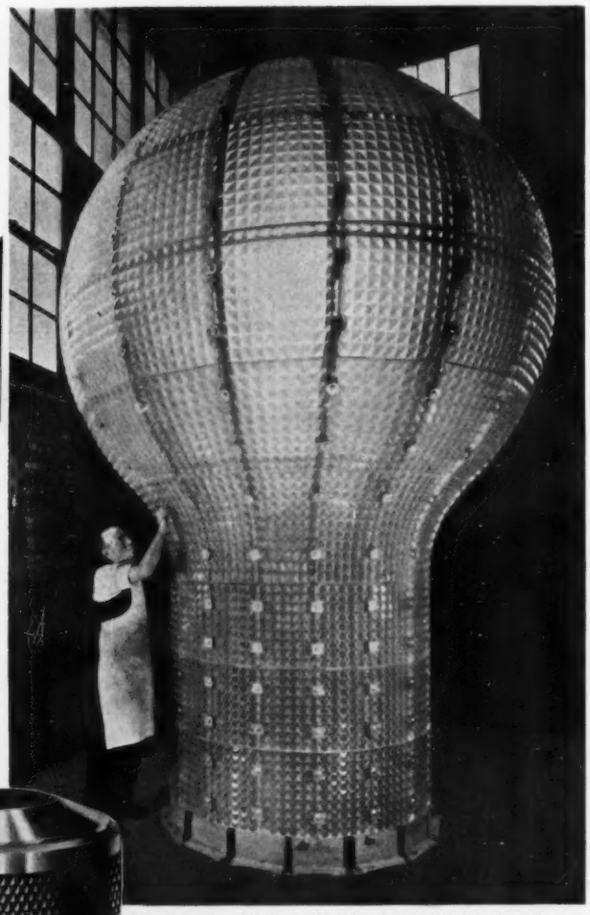
Metal Forming Tool, Die for Elliptical Holes. Frank J. Minkel, Buffalo, N. Y., assigned to Feders Mfg. Co., Inc., Buffalo, N Y. Patent 2,102,572.

IF IT'S A

Jacobs

IT HOLDS!

SUPER



Corning Glass Works made Edison's first light bulb—and have now made this world's largest bulb, 14 feet high, to surmount the Edison Memorial Tower, Menlo Park, N. J. Weight 6000 pounds. 5200 Watts.

The Jacobs Ball Bearing Super Chuck is the greatest chuck in Jacobs history. It is everything that a chuck should be; everything that the most exacting user could demand.

THE JACOBS MANUFACTURING COMPANY
HARTFORD CONNECTICUT, U. S. A.

NEW BOOKS

MOTION AND TIME STUDY. *By Ralph M. Barnes, Professor of Industrial Engineering, University of Iowa. 285 pages, 6 x 9 in., including an index and a bibliography. Illustrated. Bound in cloth boards. Published by John Wiley & Sons, Inc., New York. Price, $3.75.*

The author has produced a text that should be useful to the student, the young engineer or manager, the more advanced executive. He defines motion and time study as an analysis carried on for the purpose of (1) finding the most economical way of doing work; (2) standardizing the methods, materials, tools and equipment; (3) accurately determining the time required by an average worker to do the task; (4) training the worker in the new method. Succeeding chapters explain the contributions to this end made by Taylor, the Gilbreths, and other pioneers.

Of particular interest is his list of 22 rules for applying the principles of motion economy to the human body, to the arrangement of the work place, and to the design of tools and equipment. While all of these rules

are well worth studying, the two of principal interest to machine tool users and builders are these: (21) Handles such as those used on cranks and large screwdrivers should be designed to permit as much of the surface of the hand to come in contact with the handle as possible. This is particularly true when considerable force is exerted in using the handle. For light assembly work the screwdriver handle should be so shaped that it is smaller at the bottom than at the top. (22) Levers, crossbars and handwheels should be located in such positions that the operator can manipulate them with the least change in body position and with the greatest possible mechanical advantage.

Other topics discussed include: Standardization; Making the Stop-Watch Study; Determining Rating Factors; Allowances and Time Standards; Use of Elemental Time Data and Formulas; Time Standards for Die and Tool Work; Training the Operator.

Problems are given on the subject matter of each of the 22 chapters.

TRADE PUBLICATIONS

ALLOY WIRE Current carrying capacities and other information, as well as list prices per pound, are tabulated for various alloy metal wires in a 36-page catalog published by Alloy Metal Wire Co., Inc., Prospect Park, Pa.

APPLIANCES The November, 1937 supplement to the May, 1937 List of Inspected Electrical Appliances has been published by Underwriters' Laboratories, Inc., 161 Sixth Ave., New York, N. Y.

CARBIDE TOOLS The application and maintenance of Firthite-tipped tools is discussed in an 8-page bulletin recently published by Firthite Div., Firth-Sterling Steel Co., McKeesport, Pa. This fully illustrated booklet discusses basic principles to be followed in securing the best results from applications of tipped tools.

COMBUSTION INSTRUMENTS The Hays Corp., Michigan City, Ind., announces publication of three catalogs giving information on draft gages, combustion meters and draft control instruments.

COUPLINGS Roller-chain flexible couplings are listed and described in a 8-page bulletin, No. 63, offered by Baldwin-Duckworth Chain Corp., Springfield, Mass.

CYLINDRICAL GRINDERS Landis Tool Co., Waynesboro, Pa., offers Catalog No. E-37, a 12-page booklet describing the 16-in. Type B plain hydraulic cylindrical grinder. Specifications are listed for five sizes of this machine.

DEMAGNETIZERS A folder describing several standard demagnetizing units is being mailed by R. B. Annis Co., 1505-07 E. Michigan St., Indianapolis, Ind.

DEGREASING Solvent degreasing is discussed in a 12-page bulletin published by G. S. Blakeslee & Co., 19th St. and 52nd Ave., Cicero Station, Chicago, Ill. Specific uses of solvent degreasing machines are described.

ELECTRIC ETCHERS Two standard etching units, offered by R. B. Annis Co., 1505-07 E. Michigan St., Indianapolis, Ind., are described in a folder recently published.

DIE CASTINGS Two booklets offered by The New Jersey Zinc Co.,

The Aristocrat of Bearings

As with all fine things, there can be no greater tribute to the real character of Hoover Ball and Tapered Roller Bearings than a roster of their discriminating buyers. Built too well to be cheap enough for ordinary use, Hoover Bearings are definitely a mark of distinction for the machines they serve.

HOOVER *Ball and Bearing Company*
ANN ARBOR · MICHIGAN

160 Front St., New York, N. Y., illustrate recent applications of zinc-alloy die castings in electrical equipment and in business machines.

ENGINEERING JOURNAL A complete revision of the general information section of the Timken Engineering Journal has been completed and copies of the fifth edition are available. This journal, offered by the Timken Roller Bearing Co., Canton, Ohio, consists of 294 loose-leaf pages furnished in a standard 8½x 11 in. binder. For the convenience of designers, accurate full and half-size detail bearing drawings are given for the complete list of single-row Timken bearings up to an outside diameter of 14 in.

FANS The Northern Blower Co., W. 65th St., Cleveland, Ohio, announces publication of a bulletin showing the improved, high-speed "Norblo" exhaust fan. A table of capacities is included.

LATHES Boye & Emmes lathes are listed and described in Bulletin No. 30 offered by Bryant Machinery & Engineering Co., 400 W. Madison St., Chicago, Ill., general distributor for The Boye & Emmes Machine Tool Co. Specifications are tabulated for nine sizes of standard lathes.

LUBRICATION Meter units for feeding the correct amount of oil to each bearing in connection with automatic lubricating systems are featured in Bulletin F, announced by Bijur Lubricating Corp., Long Island City, N. Y.

METAL HOSE Applications of American flexible metal hose in various industries are illustrated in Bulletin CB-9, announced by American Metal Hose Branch, American Brass Co., Waterbury, Conn.

METAL HOSE Various types of flexible metal hose for steam and oil are shown in Bulletins offered by Chicago Metal Hose Corp., Maywood, Ill.

MOLDING PRESSES A 4-page illustrated folder describing self-contained molding presses is offered by The Standard Machinery Co., Mystic, Conn.

MOTORS Century Electric Co., 1806 Pine St., St. Louis, Mo., offers a 24-page bulletin, Form No. 1039, gives information concerning the electrical characteristics of fractional horsepower motors, suggests how these characteristics can be effectively applied to motor driven equipment and includes a description of several types of small motors.

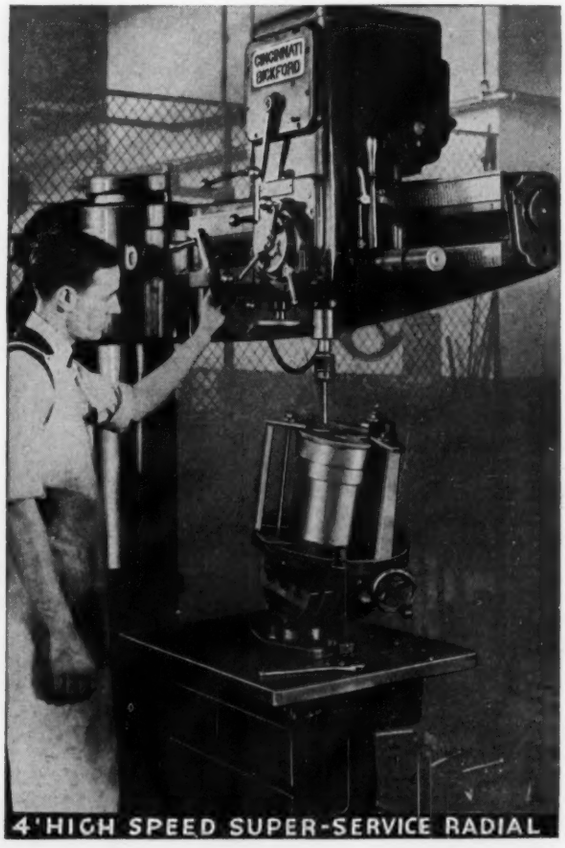
NICKEL ALLOYS "Design and Construction of Heavy Equipment in Monel, Nickel and Iconel" is the title of Bulletin No. T-14, announced by Development & Research Div., The International Nickel Co., Inc., New York, N. Y.

PACKAGING The "Blue Book of Packing" offered by The Gerrard Co., Inc., 2915 W. 47th St., Chicago, Ill., covers wire strapping and reinforcement; models of the hand wire-tying machines are illustrated.

PNEUMATIC CONTROLS National Regulator Div., Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., has announced publication of a bulletin describing features of pneumatic control equipment for heating, ventilating and air conditioning applications.

PRODUCTIMETERS Catalog Section No. 20, offered by Durant Mfg. Co., Milwaukee, Wis., gives illustrations and short descriptions of 50 styles of "Productimeter" counting and registering instruments.

PRECISION



4' HIGH SPEED SUPER-SERVICE RADIAL

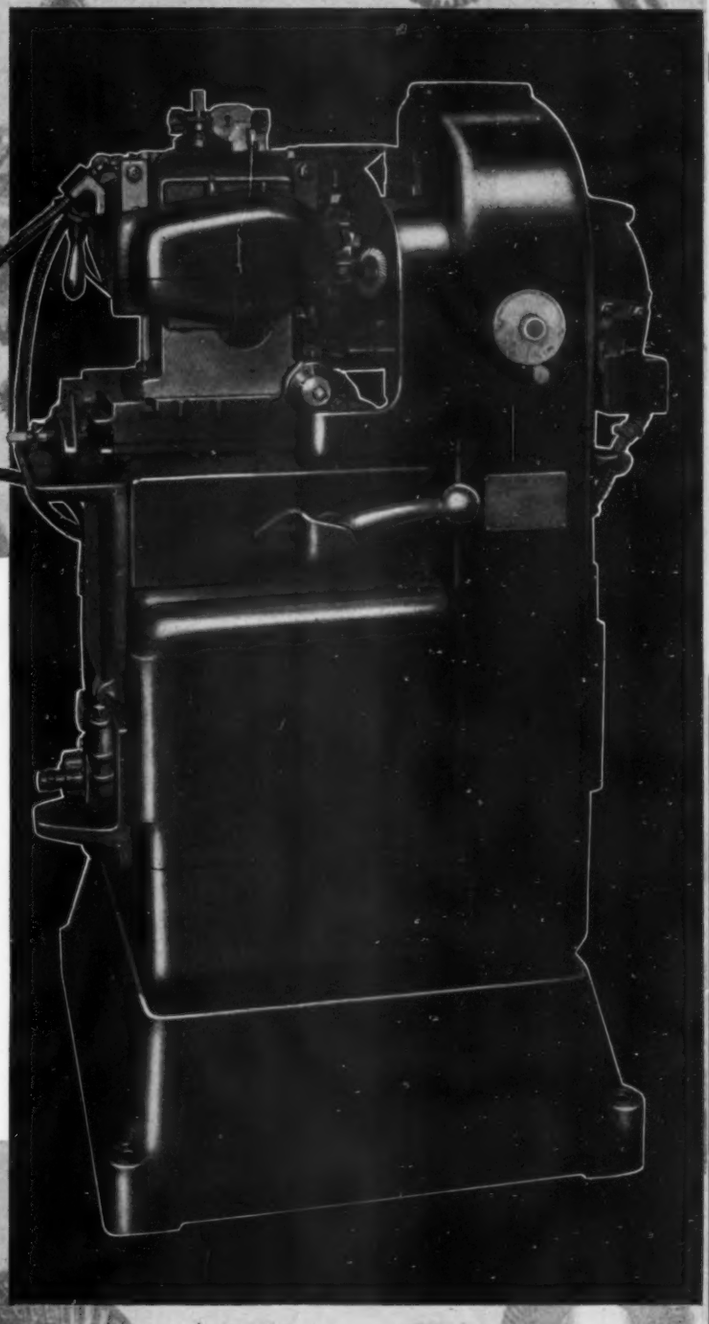
Tool Room Radial Drill
In New G. E. Plastics Department Plant

The Plastics Department of the General Electric Company announces their new molding plant in Pittsfield, Mass., for the manufacture of Textolite plastics products. It is hailed as the most modern and the finest equipped plant of its kind.
Significant and fitting, you will agree, is their recent installation of new Super Service Radial Drills —used in their large toolroom for the manufacture of precision molds. This work demands the accuracy, convenience and versatility which distinguish Cincinnati Bickford drilling machines.

THE CINCINNATI BICKFORD TOOL CO., OAKLEY, CINCINNATI, OHIO

SUPER-SERVICE RADIALS

Accuracy COUPLED WITH *Economy*



THE 3" SPIRAL BEVEL GEAR GENERATOR

Curved tooth spiral bevel gears of the smaller sizes are cut accurately and economically on this machine by the familiar Gleason generating system. The ease of setup and simplicity of operation make it ideal for the economical production of small spiral bevel gears.

Capacity: 4 to 1 ratio, 10 D. P., $\frac{5}{8}$" face, $4\frac{7}{16}$" dia.

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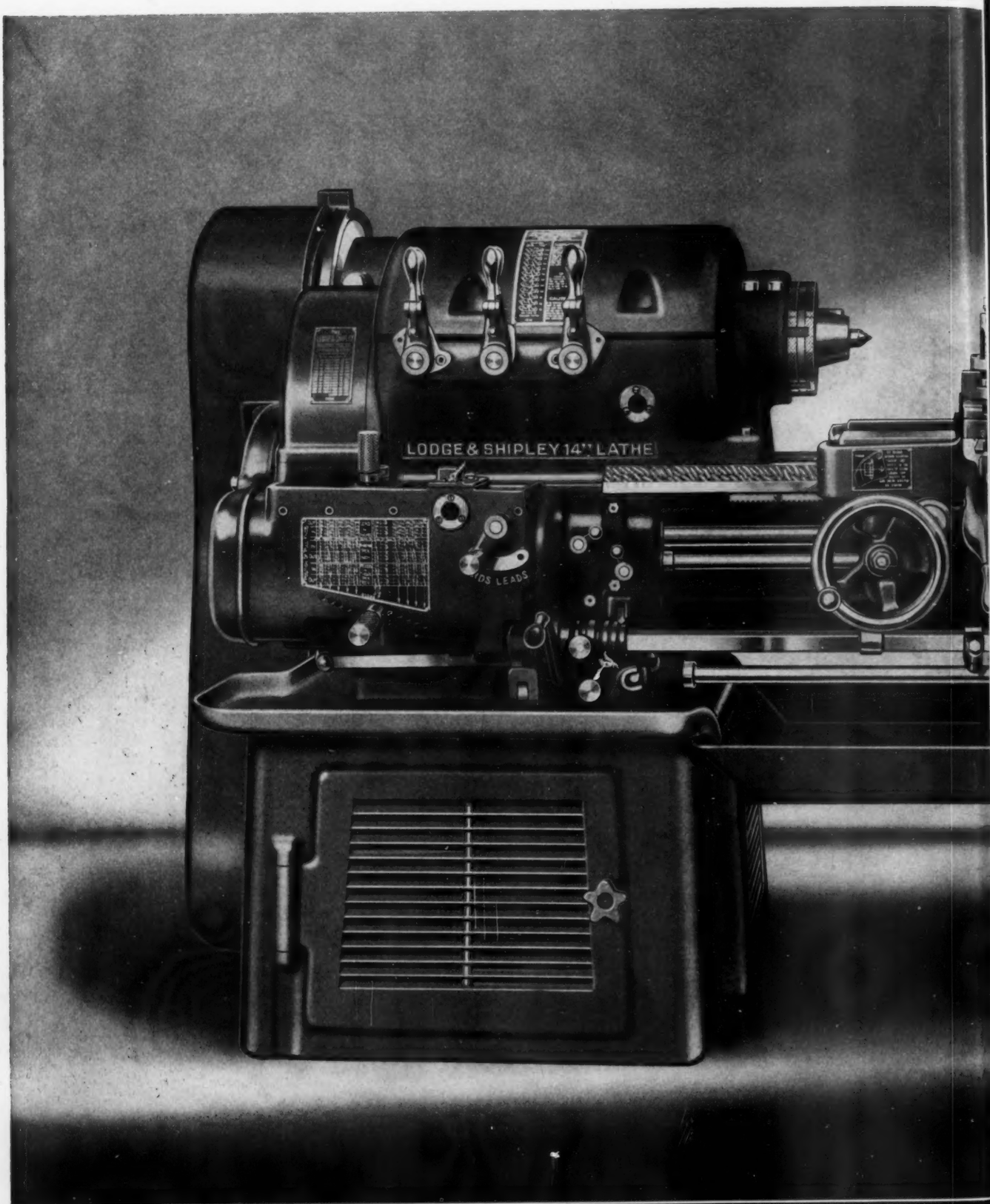
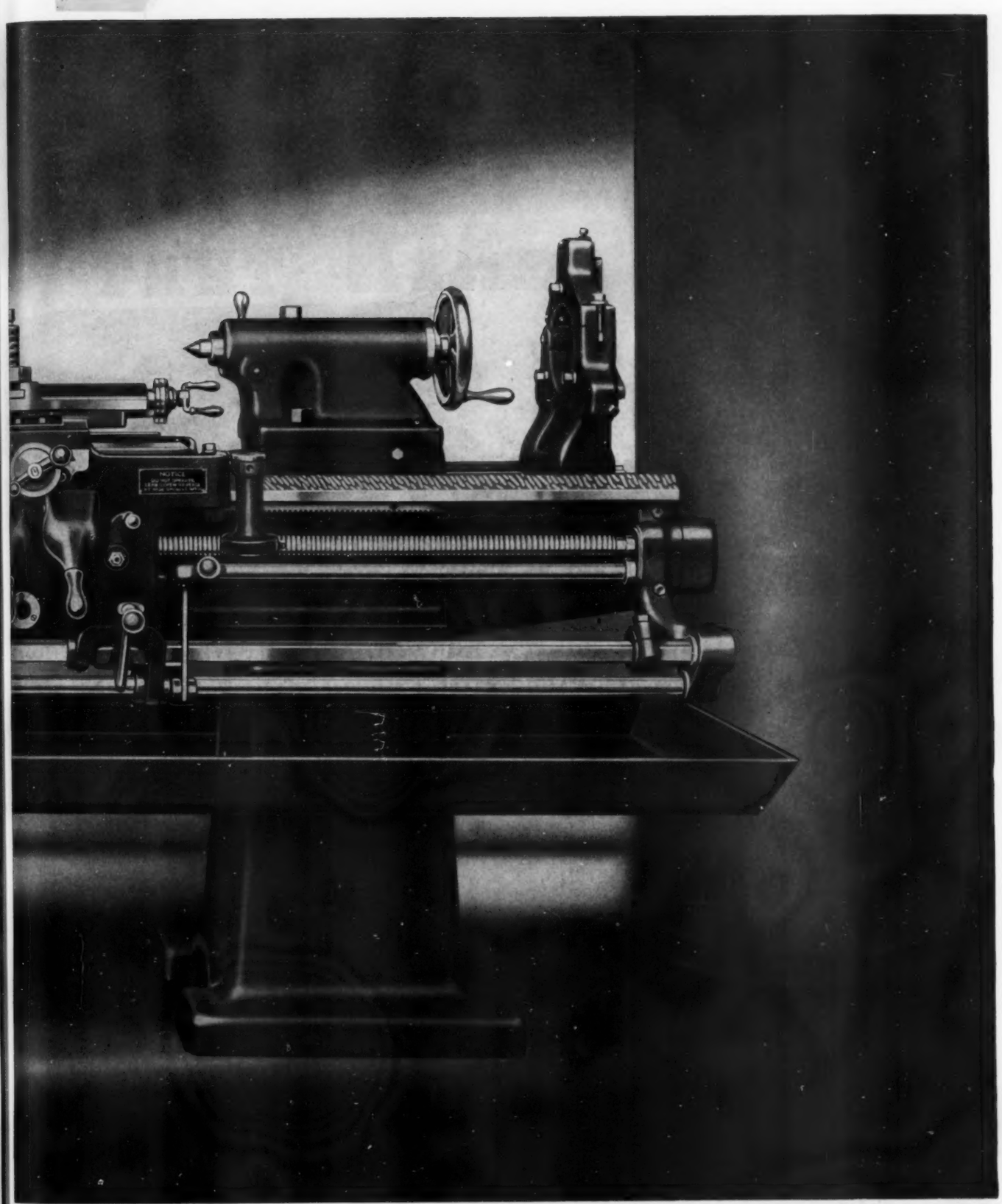
GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy Years

1000 UNIVERSITY AVENUE, ROCHESTER, N. Y., U. S. A.



ASSURED ACCURACY FOR YOUR TOOLROOM



THE LODGE & SHIPLEY MACHINE TOOL COMPANY

CINCINNATI, OHIO, U. S. A.

A RIGID CHAIN THAT

REQUIREMENT ~~0.6″ in the center when suspended on two supports 18 feet apart.~~

PERFORMANCE 0.3″.

EACH of the 70 links of this turret chain for a cruiser is machined all over on these two CINCINNATI Milling Machines. When assembled they must not have a droop of more than 0.6″ in the center when suspended on two supports 18 feet apart. No arc is allowed. Actually, the chain you see suspended in the picture had a droop of 0.3″. The chain must also coil up as shown.

This severe test in accurate milling illustrates the capacity of CINCINNATI Milling Machines for fine toolroom and job shop work. Equally important are the ease and rapidity with which delicate work of this kind is produced.

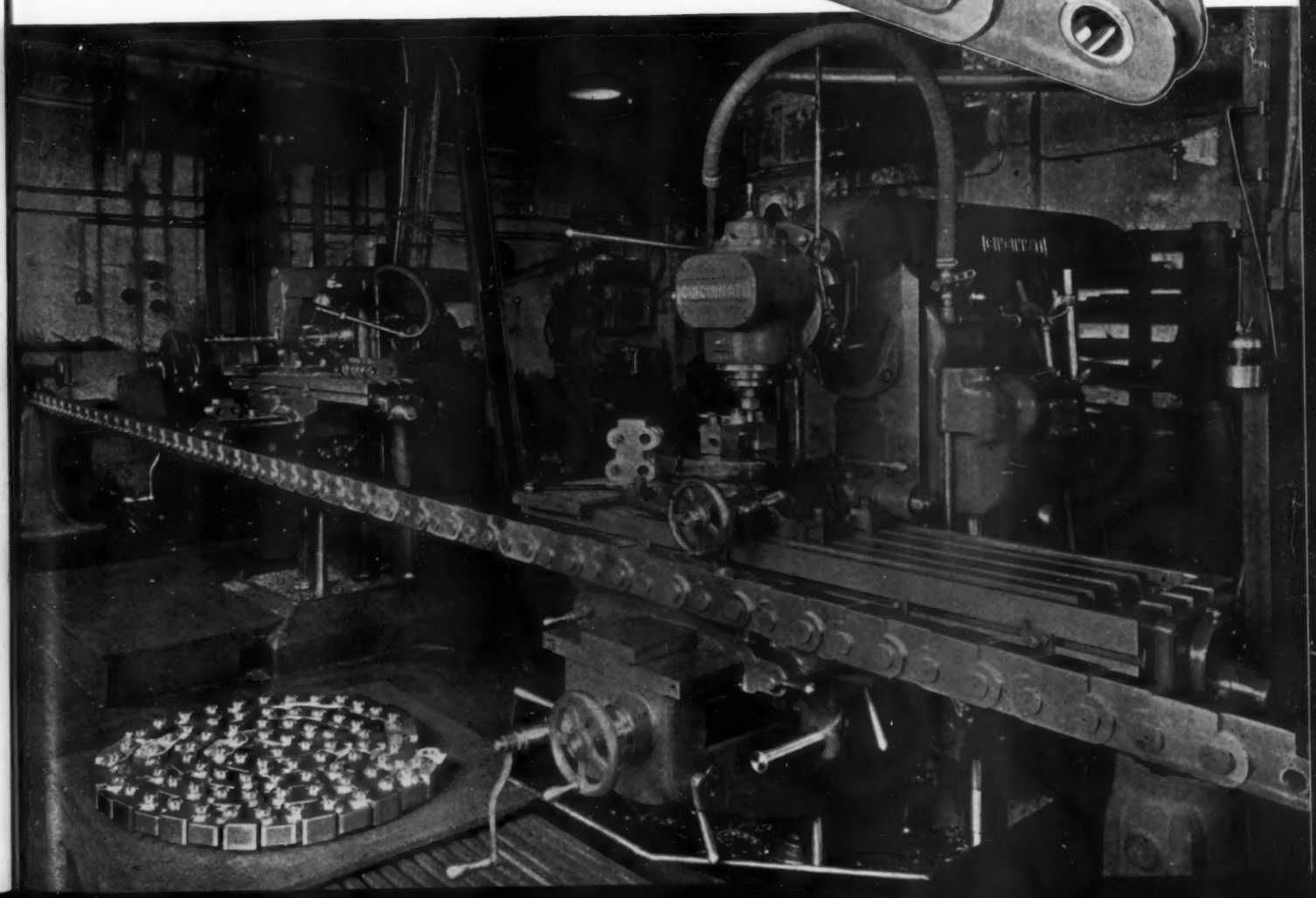
You, too, will find these fine tools profitable on your fine work . . . and manufacturing jobs, too! Write for M-712 and M-719.

CINCINNATI

A SYMBOL OF A DEFINITE STANDARD OF WORTH

THE CINCINNATI MILLING MACHINE CO.
Cincinnati, Ohio, U. S. A.

Coils ...



SIMPLICITY OF OPERATION

J&L Universal Turret Lathes are designed for ease of operation, to give the operator a more productive day.

A single lever controls the forward and reverse motion of the spindle and, in its neutral position, automatically applies a brake.

A wide range of twelve spindle speeds is available by the movement of a single lever.

Nine feeds for the turret travel are ready for use by the movement of a single lever.

Nine longitudinal feeds for the carriage and nine feeds for the cross slide, are also controlled by a single lever.

These features mean that selection of the right speed and feed is easily and quickly done. The result—lower cost per piece on your turning work.

A J&L Engineer will be glad to help study your particular needs.

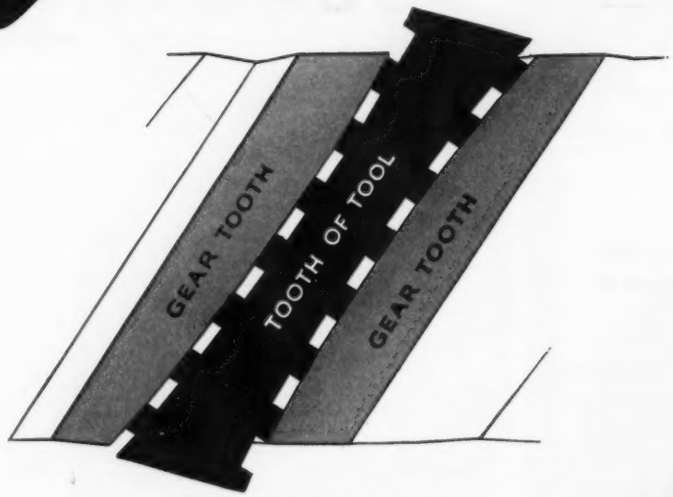
JONES & LAMSON MACHINE

SINGLE LEVER
SPEED SELECTOR

COMPANY, Springfield, Vermont, U. S. A.

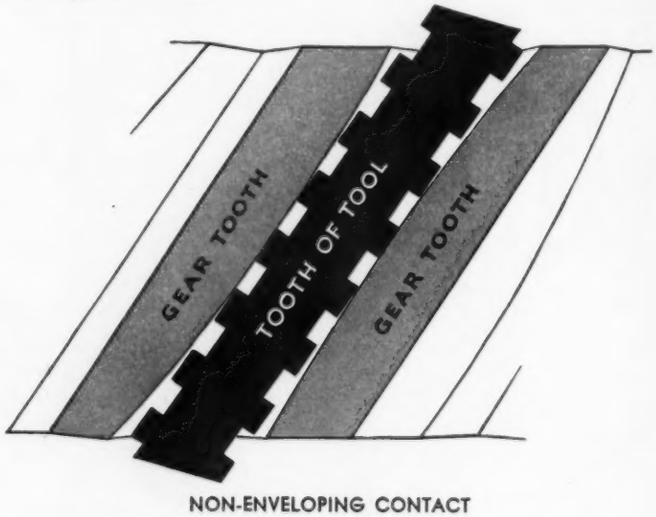
Why THE ENVELOPING G

Produces M



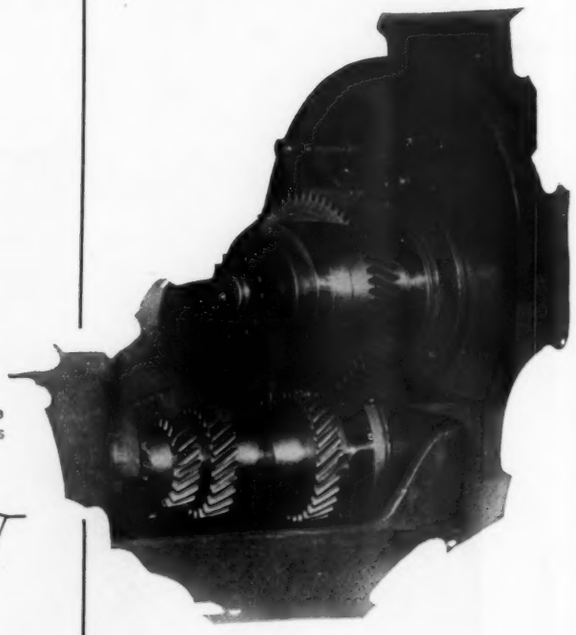
ENVELOPING CONTACT

is illustrated in this section of tool and work teeth taken in a plane tangent to the pitch cylinder. Note:—the tool and work are always under positive control.



NON-ENVELOPING CONTACT

does not provide positive control under certain conditions.



The Fellows Line of Products includes:

GEAR SHAPERS • HOURGLASS GEAR SHAPERS • COMPLETE LINE OF CUTTERS • THREAD GENERATORS • MASTER GEARS • LAPS AND LAPPING MACHINES

GEAR GENERATOR

More QUIET Gears . . .

A NEW GEAR FINISHING METHOD FOR *Volume Production*

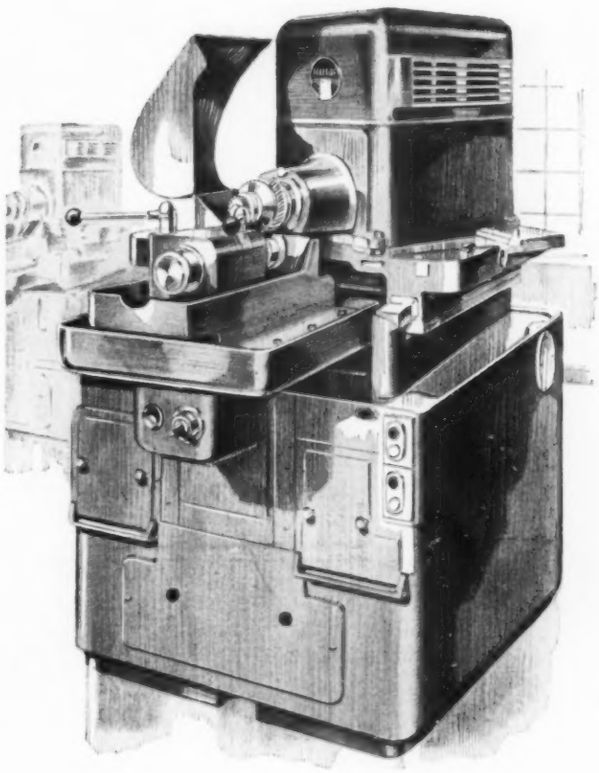
The principle upon which this process operates provides enveloping contact between teeth of tool and work to produce gears having ALL the characteristics essential for quiet operation:

Smooth Finish—Uniform Tooth Spacing—Duplication of Tooth Profile—Concentricity

The enveloping form of tool permits the selection of a setting angle which provides the freest possible cutting action *without loss of control over accuracy*. This advantage is *exclusive* with the *Enveloping Generating Process*.

The provision of a "hunting" tooth in the tool, combined with high rotative and slow traverse speeds, provides the essential requirements for high accuracy and, at the same time, permits finishing the gear in one traverse cycle. Result: highest precision and smoothest tooth finish ever achieved on a volume production basis.

Other outstanding advantages are: high production, low tool cost per gear, lowest reject losses —thus setting a new standard of *low cost production*. For confirming details, write for our new bulletin "The Enveloping Generating Process." The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Building, Detroit, Mich.



FELLOWS
GEAR SHAPER METHODS

TESTING EQUIPMENT • HELICAL CUTTER SHARPENERS • BURNISHING GEARS

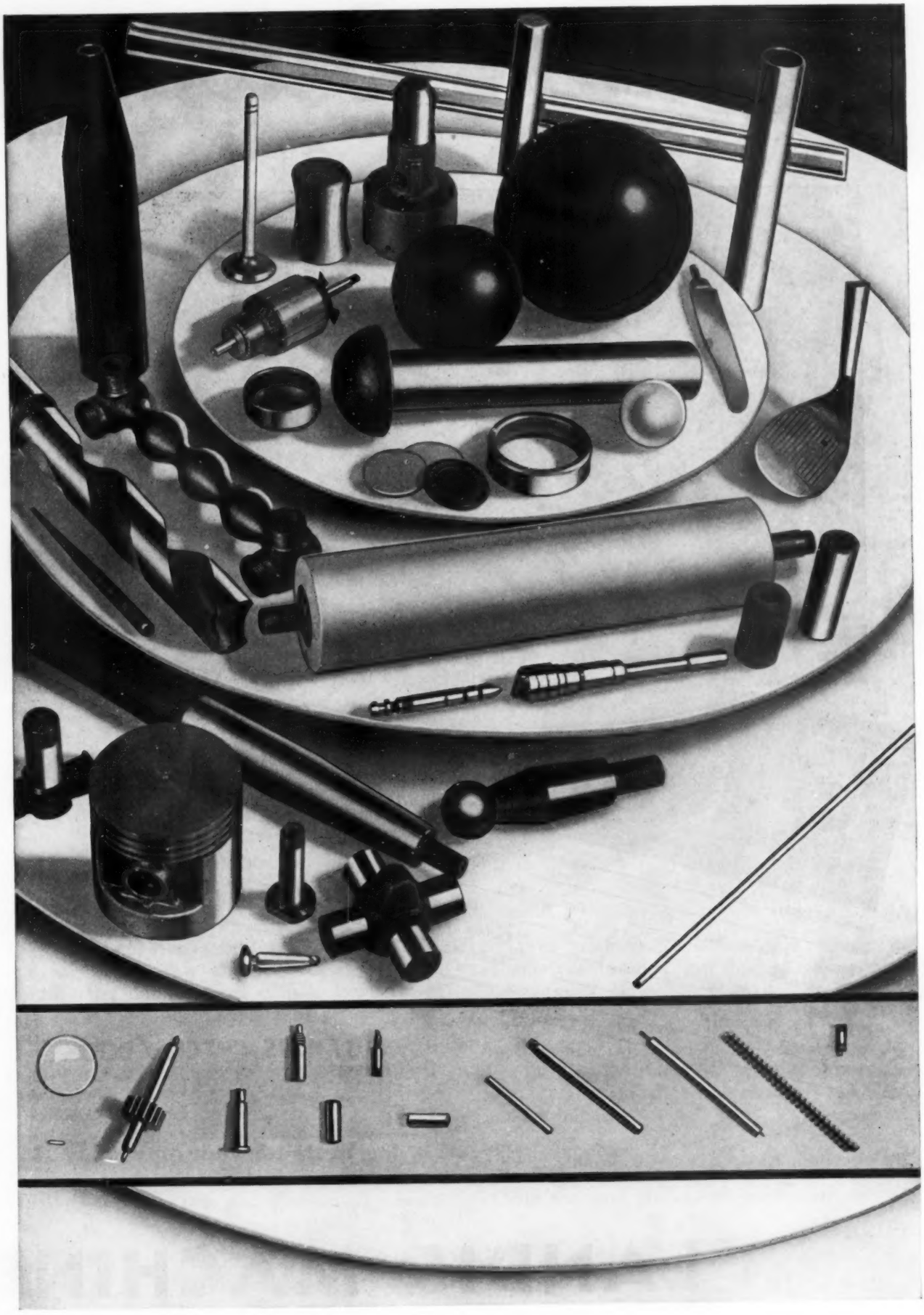
• • • AND STILL REACHING OUT

Cincinnati Centerless Grinding Machines are continually cutting production costs. Because of their versatility, many jobs, heretofore considered impractical, are being finished accurately and economically! There's no limit to the successful application of the Centerless Method of Grinding.

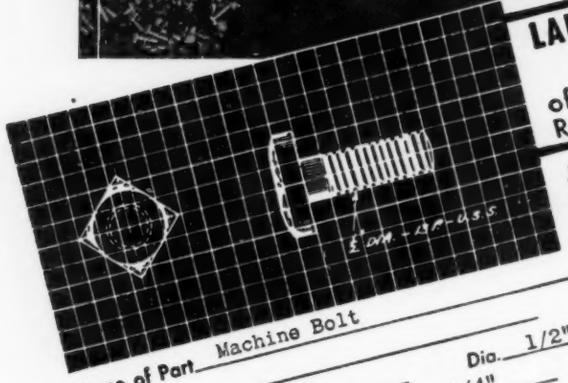
How about your jobs? Perhaps they, too, can be profitably handled on these precision grinding machines. Let us show you what the Centerless Method of Grinding can do in the solution of your problems.

Cincinnati Grinders Incorporated

Cincinnati, Ohio, U. S. A.



Greater Output



LANDIS MACHINE CO.
CHECK BOOK
of Threading Production Records . . . . . .

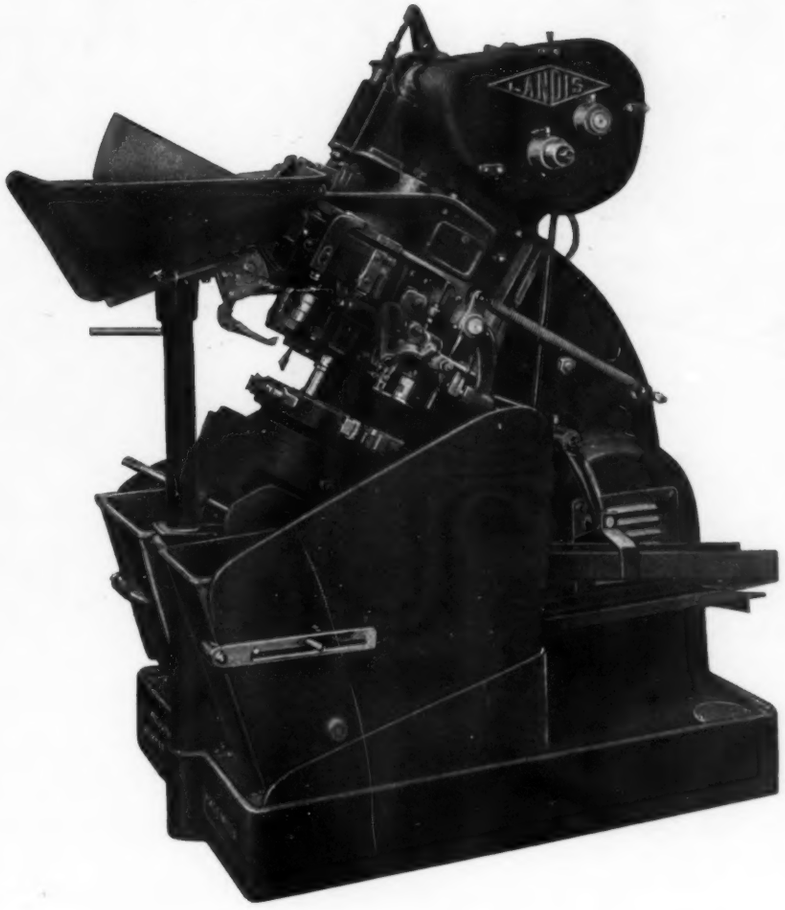
Job No. 29
Equipment Used LANDIS Auto. Forming & Threading Machine
Name of Part Machine Bolt
Material Hardness
Thread Form N. C. Dia. 1/2" Pitch 13
Specifications Length 1 1/4" Limits
Production 1100 per hour Cutting Speed 60 ft per minute
Threading Cost Remarks Chasers thread from 4000 to 5000 bolts between grinds.

LANDIS CHECK ✓ BOOK
. . . are you handling your threading jobs efficiently?
. . . . . The Check Book will tell you!

Write for your copy today

LANDIS MACHINE

Production Increased 10 to 40%



The LANDIS Automatic Forming and Threading Machine . . .

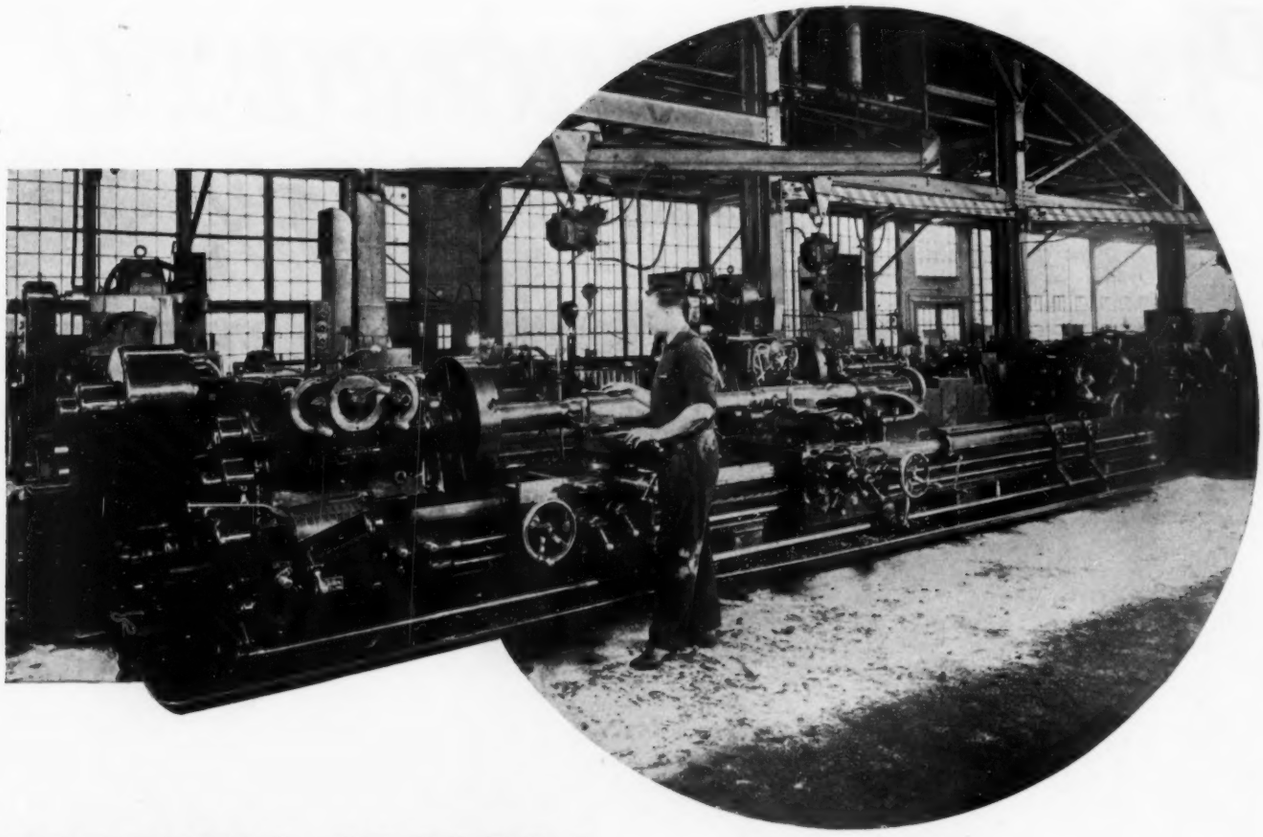
THE Landis Automatic Forming and Threading Machine is a super-production unit, which rates the standards of bolt manufacturing both from the standpoint of accuracy and production.

Sound design, careful selection of materials and workmanship have reduced non-productive time on this machine to a minimum. High operating speeds and the accelerated motion between threading periods have enabled the Landis to maintain a production which is from 10 to 40% greater than that obtained with other types of machines. The use of a Landis is assurance of threaded parts that are well formed and correctly threaded.

The Landis Automatic Forming and Threading Machine can handle bolts up to 3/4" in diameter and 6" long, any length of thread up to 2 1/2", and any style of point—cupped, flat, round, dogpoint or full cone. One operator can handle as many as four Landis Automatics without difficulty.

May we send you complete details?

CO., INC., WAYNESBORO, PA.



BREAKING RECORDS *in* MAKING ROCK BITS!

Machining time has been greatly reduced and quality standards materially stepped up in the machining of Rock Bits on this "AMERICAN" 30″ Double Carriage Lathe.

The Chicago Pneumatic Tool Co. has established a new production record since this "AMERICAN" cost cutter took over the job.

With power, rugged stamina and ease of operation at the command of the operator, hours are knocked off the toughest machining job—a saving in time and an increase in productivity which result in profits which return the investment in a remarkably short period.

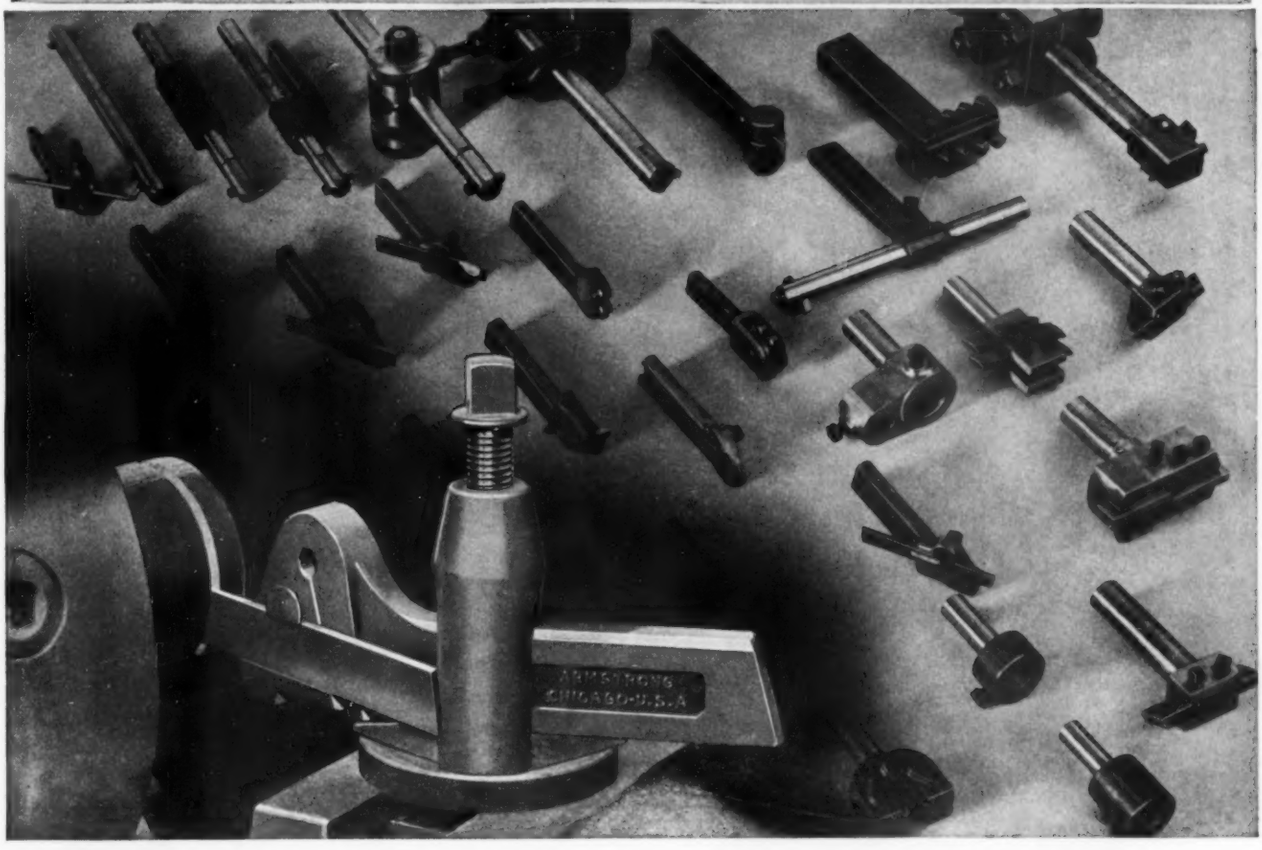
Tough jobs are tough merely in name on the "AMERICAN". Every facility is provided for simplifying the handling of difficult work. Double carriage equipment on this lathe permits turning and boring operations to be done separately or simultaneously and thereby effects outstanding savings in machining hours.

Whatever *your* turning job, get all the facts concerning "AMERICANS" — and their cost-cutting possibilities.

LATHES
RADIALS
SHAPERS

The
AMERICAN TOOL WORKS CO.
CINCINNATI . . . . . OHIO

ARMSTRONG



Have you the right ARMSTRONG TOOL HOLDERS for machining today's tougher steels?

The newer, tougher alloy steels need offer no unusual machining problems, for there are ARMSTRONG TOOL HOLDERS especially designed to handle them. The ARMSTRONG Spring Cutting-off Tools have a "goose-neck" form and resiliency that prevents work from climbing up on the cutter, prevents excess tool breakage, and makes cutting-off an ordinary instead of an extraordinarily expensive operation. Other ARMSTRONG TOOL HOLDERS, that every shop working in tough alloy steel should have, are the Spring Threading Tool and the new ARMSTRONG Carbide TOOL HOLDERS. Equipped with Armide (Carbide Tipped) Cutters, these "carbide" Tool Holders will machine hard steels without annealling, will go as much as 50 times as long without re-ginding.

It is a sound policy whenever faced with a difficult cutting problem to first look in the ARMSTRONG B-35 catalog for there you will find efficient cost-cutting tools for every operation on lathes, planers, slotters, and shapers.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. FRANCISCO AVE., CHICAGO, U. S. A.

Eastern Warehouse and Sales: 199 Lafayette St., New York

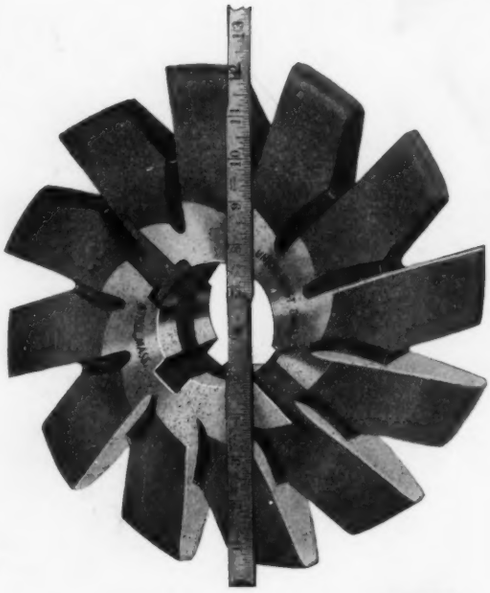
San Francisco **London**

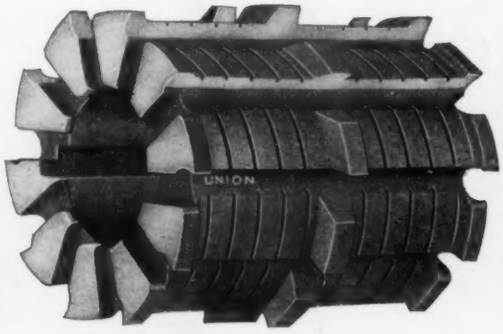
ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

UNION

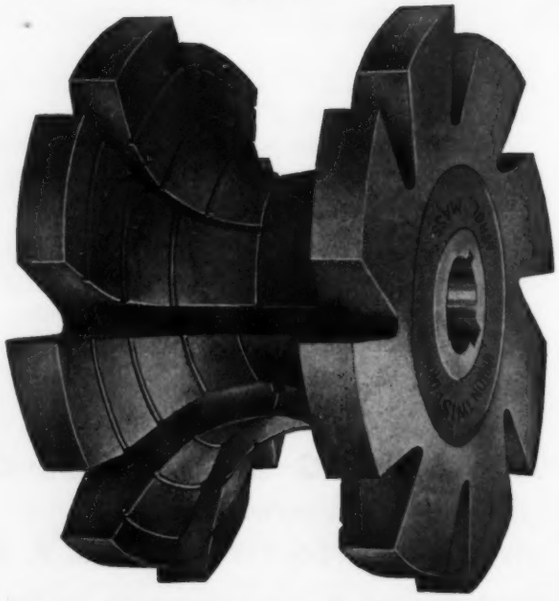
CUTTERS · DRILLS · REAMERS

STOCK OR SPECIAL





"The Tools You Buy Again"



UNION TWIST DRILL CO., ATHOL, MASS., U. S. A.

New York Store: 61 Reade St. Chicago Store: 11 So. Clinton St. Los Angeles Store: 168 So. Central Ave. San Francisco Store: 121 Second St. Detroit Store: 6540 Antoine St. S. W. Card Mfg. Co. Division: Mansfield, Mass. Butterfield Division: Derby Line, Vt. and Rock Island, Quebec. Representatives Throughout World.

MEEHANITE METAL

INSURES: LONGER LIFE
SMOOTHER OPERATION • BETTER PERFORMANCE • A HIGHER FACTOR OF SAFETY • LESS MAINTENANCE • FEWER REPAIRS

Meehanite Castings are uniformly dense throughout all sections, have superior wear-resisting qualities, greater strength at higher temperatures, and do not grow under normal conditions of service.

For complete information on Meehanite Castings, consult the foundries listed below.

METAL MEEHANITE

MANUFACTURERS:

American Laundry Machinery Co. ..... Rochester, N. Y.
Banner Iron Works ..... St. Louis, Mo.
E. W. Butterworth & Sons Co. ..... Bethayres, Pa.
Cincinnati Grinders Incorporated ..... Cincinnati, Ohio
The Cincinnati Milling Machine Co. ..... Cincinnati, Ohio
Cooper-Bessemer Corporation ..... Mt. Vernon, Ohio
Crawford & Doherty Foundry Co. ..... Portland, Oregon
M. H. Detrick Co. ..... Peoria, Ill., Newark, N. J.
Farrel-Birmingham Co. ..... Ansonia, Conn.
Florence Pipe Foundry & Machine Co.
(R. D. Wood Company, Philadelphia, Selling Agents)
Fulton Foundry & Machine Co. ..... Cleveland, Ohio
G. H. R. Foundry Co. ..... Dayton, Ohio
Gregorius Foundry Company ..... Chicago, Ill.
Hamilton Foundry & Machine Co. ..... Hamilton, Ohio
Kanawha Manufacturing Co. ..... Charleston, West Va.
Kinney Iron Works ..... Los Angeles, Calif.
Kochring Company ..... Milwaukee, Wis.
Michigan Valve & Foundry Co. ..... Detroit, Mich.
Rossdale Foundry & Machine Co. ..... Pittsburgh, Pa.
Ross-Meehan Foundries ..... Chattanooga, Tenn.
Vulcan Foundry Company ..... Oakland, Calif.
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Washington Iron Works ..... Seattle, Washington

Tools

for

Every Set-Up

They Produce

GOOD WORK • FAST •

Simplicity, durability, ease of adjustment and the ability to maintain specified requirements are characteristics of Brown & Sharpe Screw Machine Tools — *they are the same high quality as Brown & Sharpe Screw Machines.*

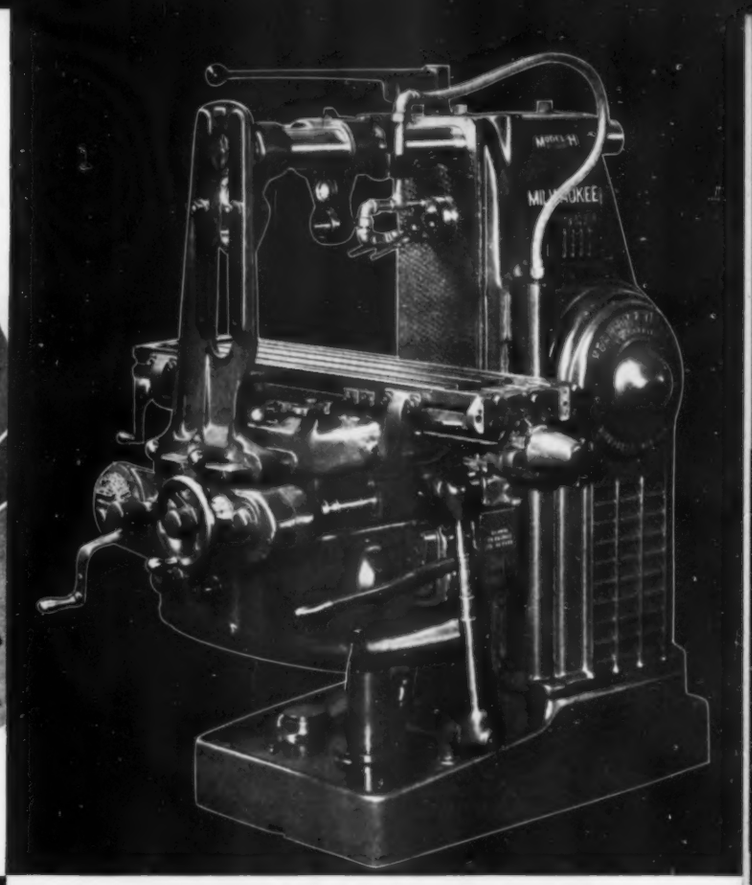
B·S

Catalog No. 32 lists the full line.
Brown & Sharpe Mfg. Co.
Providence, R. I., U. S. A.

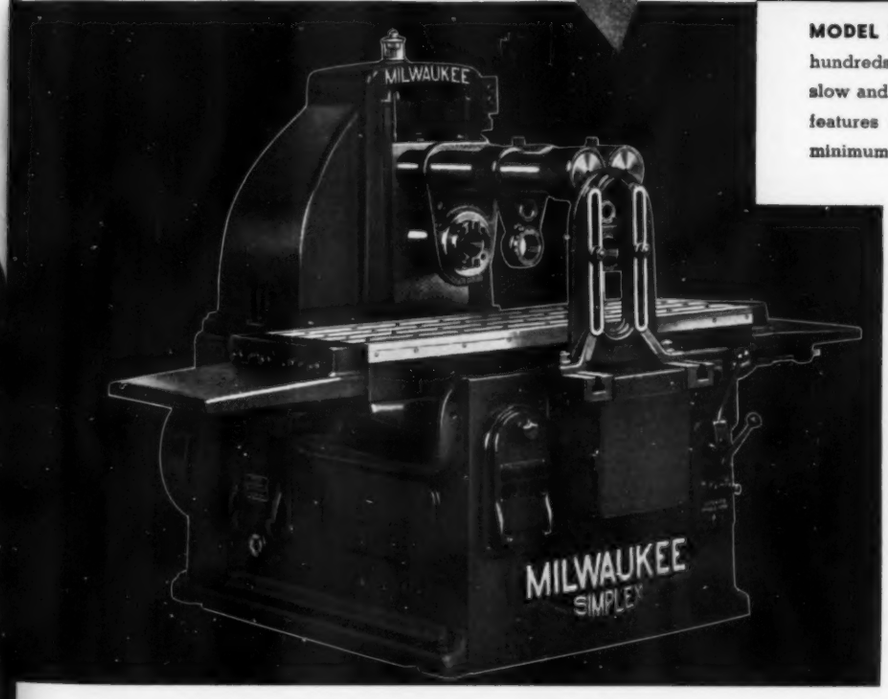
BROWN & SHARPE SCREW MACHINE TOOLS

TWO OF THE K&T MILWAUKEE LINE . . . .

FOR EVERY MILLING MACHINE REQUIREMENT



MODEL 2-HL, PLAIN TYPE: designed to handle more profitably those hundreds of milling operations for which larger machines would be too slow and cumbersome . . . Compact, fast, complete—with all tried and true features usually found only in larger machines — low in height . . . minimum floor space . . . centralized controls . . . full-back column.



BED TYPE, SIMPLEX MILWAUKEE MILLING MACHINE: a modern, high-speed manufacturing type machine. The Milwaukee 1200 and 1800 Series Simplex machines are built on the unit plan; every unit designed for strength and compactness. Anchored quill construction, doubling spindle cross range adjustment . . . fully automatic, hydraulically actuated cycles . . . disc clutch adjustable from the outside . . . centralized controls.

●

THE Kearney & Trecker organization is engaged in only one endeavor . . . concentrating on the design and building of milling machines of the highest possible quality. The two machines featured here are typical of the K & T Milwaukee line . . . milling machines for every requirement in the production line, tool-room, laboratory . . . all noted for outstanding features — the result of many years of milling machine building experience.

KEARNEY & TRECKER CORPORATION
West Allis Station
MILWAUKEE WISCONSIN, U. S. A.

MORE THAN 39 years OF DOING ONE THING WELL

K&T

Milwaukee **MILLING MACHINES**

Faster, LOWER-COST CUTTING

FOR FERROUS and non-ferrous metals and alloys, alike, leading industries employ Bakelite Resinoid *speed*-bonded abrasive wheels to reduce unit cutting costs. Stronger, more porous, cool-running and non-gumming, these wheels operate safely and efficiently on cut-offs at speeds up to 16,000 s. f. p. m.; on snagging, up to 8,500 s. f. p. m. Write for booklet 14G, "High Speed Abrasive Wheels," to learn their economy aspects.

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BAKELITE

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The registered trade marks shown above distinguish materials manufactured by Bakelite Corporation. Under the capital "B" is the numerical sign for infinity, or unlimited quantity. It symbolizes the infinite number of present and future uses of Bakelite Corporation's products.

BONDED WHEELS

FOR ECONOMICAL HIGH SPEED GRINDING

LIVE ACTION!

adequate Range, adequate Power

Why **must every correctly designed bolted assembly include a device possessing all three of these essentials? Because it must combat the unceasing forces of wear and vibration. It must have *Live Action*—constantly functioning with adequate power over a sufficient *range*. Only a *helical* Spring Washer fulfills these requirements.**

SPRING WASHER INDUSTRY

616 WRIGLEY BUILDING • CHICAGO • ILL.

The final step..

IN EFFICIENCY

● No matter how good your tapping machines may be — or how skilled your operating staff — your final step in efficiency can only be attained through the proper selection and use of High Speed Steel Taps. Made by experts of long experience, using the finest equipment and materials known to modern science; Butterfield's have demonstrated, on thousands of tough jobs, their right to be titled *"The Better Tools."*

Any of the Butterfield Stores listed below will be glad to help you prove for yourself that these "Better Tools" cost less in the long run than any others you can buy.

UNION TWIST DRILL COMPANY

Our Products Include

TAPS
Cut and Ground Thread

REAMERS
Solid and Expansion

DIES
Solid and Adjustable

SCREW PLATES

SPECIAL TOOLS

BUTTERFIELD THE BETTER TOOLS

BUTTERFIELD DIVISION

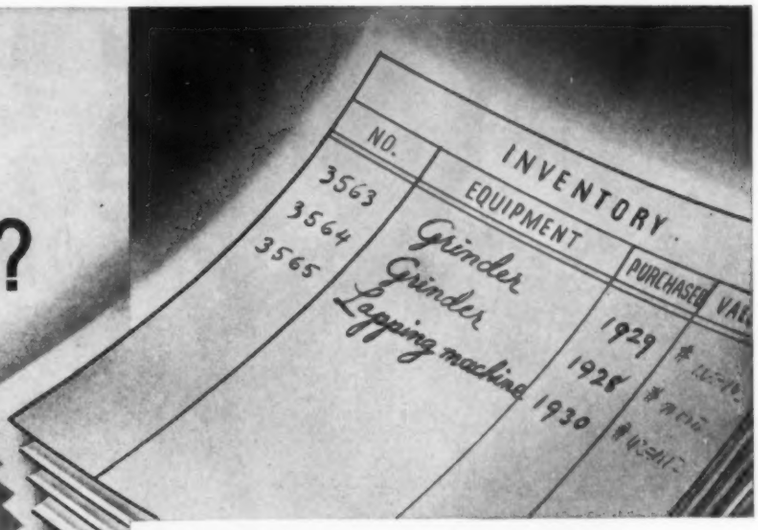
• DERBY LINE • • VERMONT • • U. S. A.

STORES: New York, 61 Reade Street; Chicago, 11 So. Clinton Street; Cleveland, Hal W. Reynolds, 3346 Superior Ave.; Detroit, 6540 Antoine Street; Toronto, 49 Main Street, Mimco; Montreal, 111 St. Paul St., West. Agents for Great Britain — Charles Churchill & Co., Ltd., 27-34 Walnut Tree Walk, Kensington, London, S. E. 11, England. Branches at Birmingham, Manchester, Glasgow, Newcastle-on-Tyne and Bristol.

YOUR INVENTORY?

Are Your Grinders an Asset?

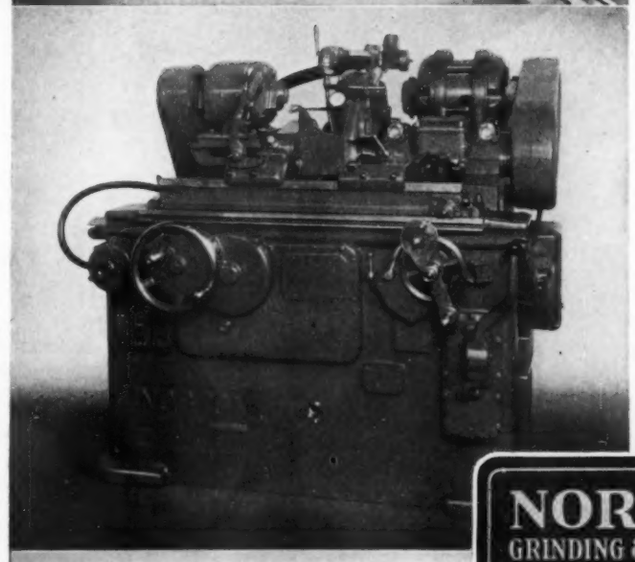
. . . or a Liability?



WILL your inventory this year show grinders that have depreciated—that do not represent much of an asset on your books? Most of them are no real asset at all but a decided liability—costing money that they cannot earn for upkeep and holding back production, reducing profits.

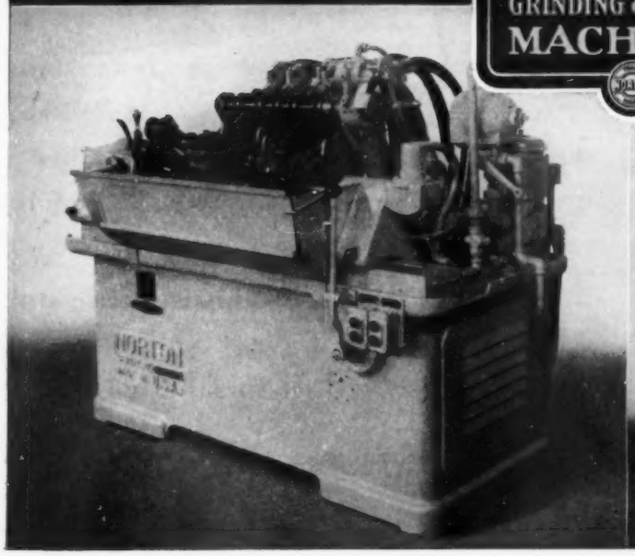
Why not consider replacing such equipment? The new Norton machines not only pay for their cost out of earnings long before they are depreciated but may prove to be the most profitable investment you can make for your business.

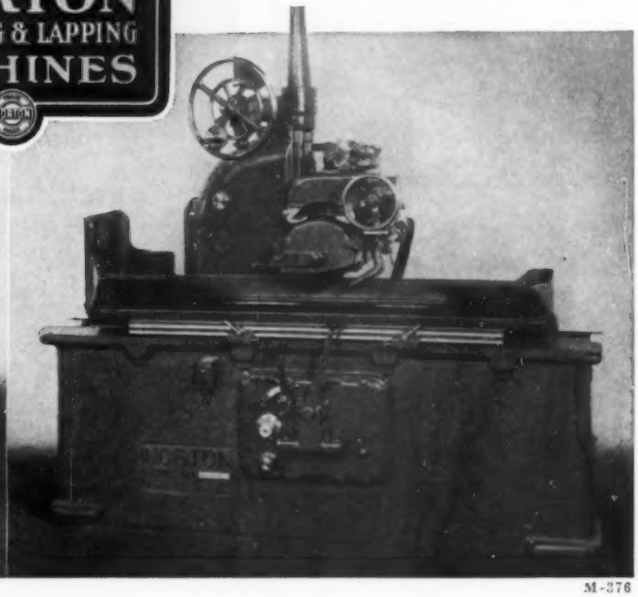
Let Norton engineers estimate possible production increases on your work. Perhaps they can suggest ways to improve the product as well as reduce costs.



NORTON COMPANY, WORCESTER, MASS.
New York Chicago Detroit Cleveland Hartford London

NORTON
GRINDING & LAPPING
MACHINES





M-376

Yeah Boss!

This is a true story . . . and absolutely unsolicited . . . . .

Dat's de doggonedest chip makin'est machine Ah ever did see! Twice a day Ah has to clean it—'stead of twice a week like de others

WHAT better proof could there be of the power and speed in this new thread miller? The sweeper's remark came one month after this new machine had been put into production alongside several older thread millers of various types. He knew nothing about machines, but the extra loads of chips made a big impression. *He knew this new machine was different.*

And it is! The Pratt & Whitney 6-inch Model "C" Thread Miller is a long jump ahead. Our years of thread milling experience, coupled with modern designing practice, have evolved a machine that does the same beautiful, accurate work, but faster and better. Its weight, rigidity and power give it the ability to remove metal rapidly, and its fine Pratt & Whitney craftsmanship assures precision threads.

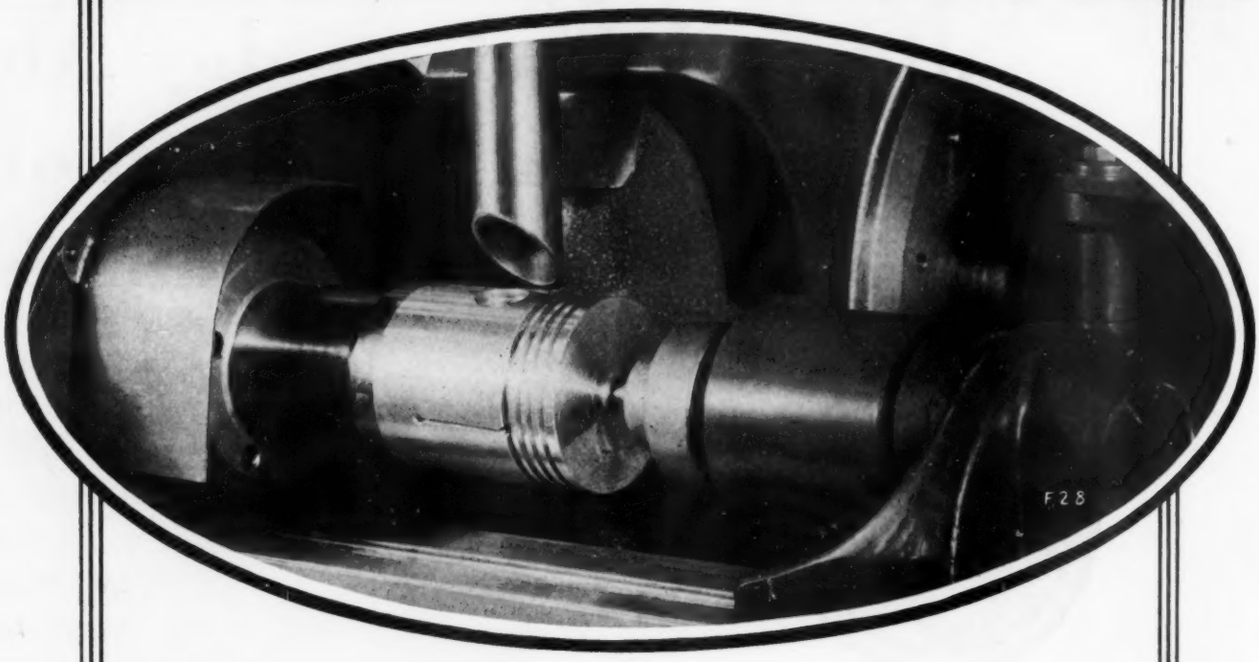
This new thread miller is completely motor driven. One motor drives the work spindle and feed mechanism, a second drives the cutter and a third operates the coolant pump. There are new indexing features, new automatic lubrication, and simplified controls to make operation easy. Standard center to center capacities are 20″ and 60″, with longer lengths to order.

If you mill threads you need complete information on this new machine. Literature is free to any interested executive. Write today to Pratt & Whitney, Division Niles-Bement-Pond Co., Hartford, Conn.

Pratt & Whitney 6-inch Model "C"

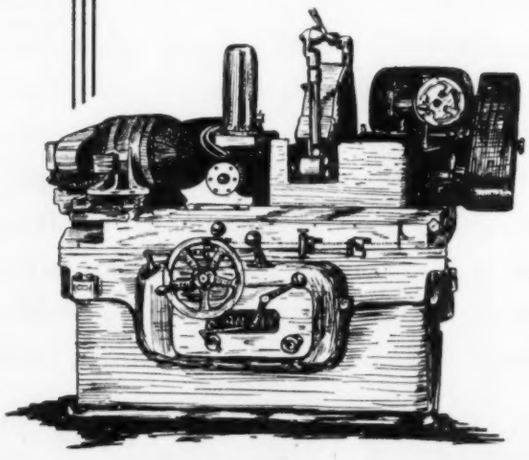
Thread Miller

Another... LANDIS *installation*



Grind Them Oval . . . .

or Grind Them Round



DO YOU grind your pistons oval or grind them round? In either case are you certain which method you will use next year . . . or the next year?

Our answer to both of these questions is THE LANDIS 5" TYPE C HYDRAULIC PISTON GRINDER. Primarily it was designed to rapidly and economically grind pistons oval. Numerous large automotive manufacturers employed these machines for this operation, only to be eventually faced with the necessity of grinding their pistons round instead. They were very fortunate, however, as it was possible for them to use the same machines without additional equipment of any kind.

So we therefore recommend THE LANDIS 5" TYPE C HYDRAULIC PISTON GRINDER as an excellent long time investment. In spite of piston design changes its versatility will serve you very well. . . .

No. 235

LANDIS TOOL COMPANY
WAYNESBORO, PENNSYLVANIA, U. S. A.

The OXWELD CM-16

A dependable, Oxy-Acetylene Cutting Machine . . priced at $137.50

An oxy-acetylene cutting machine is now available at a price which enables every steel fabricating shop to take advantage of the economies of cutting steel to shape by machine. The Oxweld CM-16—newest of a complete line of portable and stationary machines—now costs only $137.50†. Yet it has a wider cutting range and is easier to operate than any comparable machine. The CM-16 can cut straight lines and circles automatically in steel plate up to four inches thick. It can be guided by hand and, since it weighs only 45 pounds, it is particularly convenient for shaping irregular parts, or when it is necessary to carry the machine from job to job.

A Linde representative will gladly give you the story complete in all detail. For descriptive literature, write the Linde office nearest you. The Linde Air Products Company, Unit of Union Carbide and Carbon Corporation, New York and principal cities.

†Price slightly higher west of Rocky Mountains

The word "Oxweld" used herein is a registered trade-mark

Everything for Oxy-Acetylene Welding and Cutting

LINDE OXYGEN • PREST-O-LITE ACETYLENE • OXWELD APPARATUS AND SUPPLIES FROM UCC LINDE UNION CARBIDE

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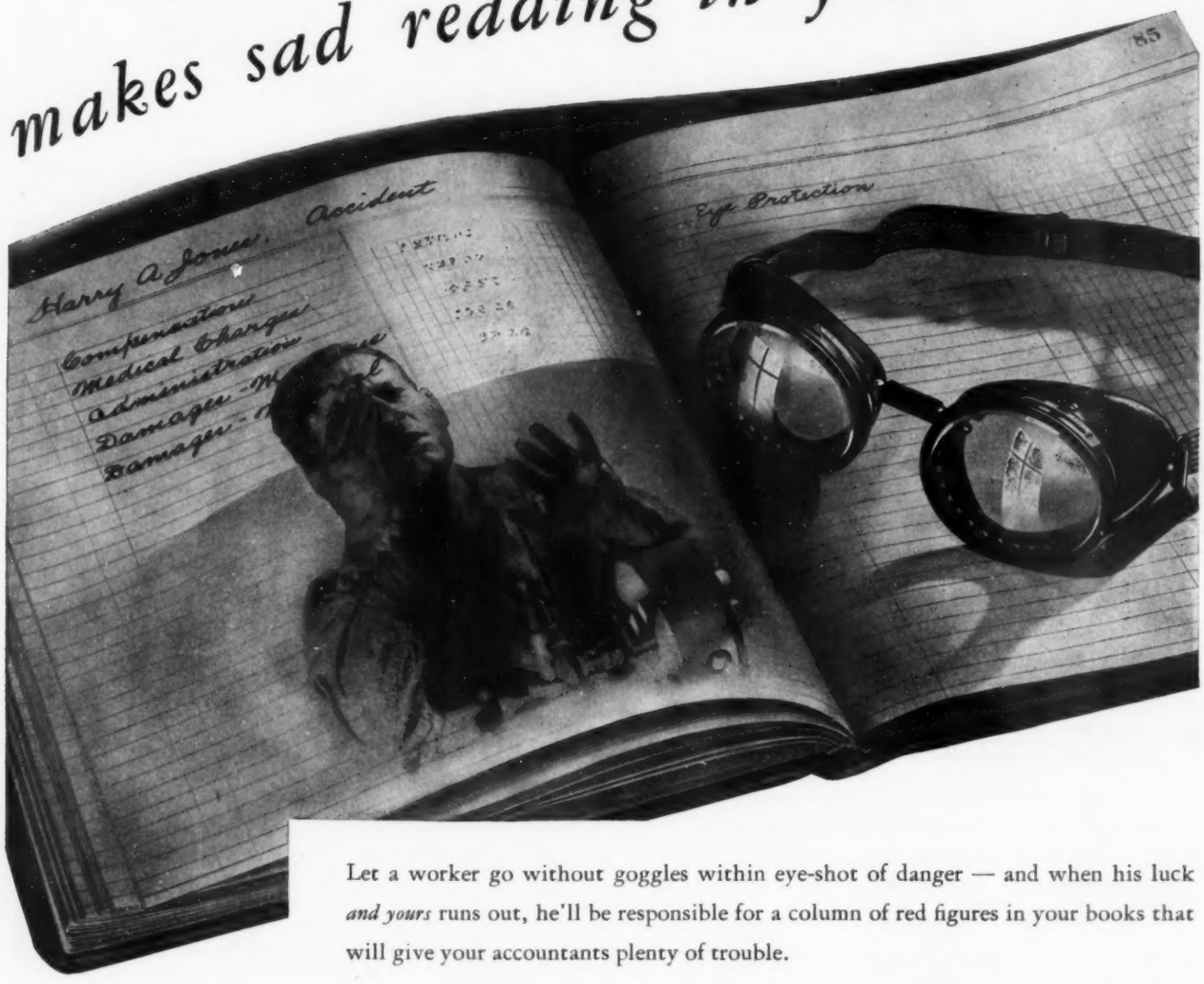
A LOST EYE

makes sad reading in your ledger



Let a worker go without goggles within eye-shot of danger — and when his luck *and yours* runs out, he'll be responsible for a column of red figures in your books that will give your accountants plenty of trouble.

First entry will be for compensation. Then others for lost time and production, perhaps damage to machine and materials. Still others for medical, administration and clerical charges. Plus *uncontrollable* charges — such as slow-down on production by fear-struck witnesses of the accident.

The American Duralite-50 Goggle (patented) is light, cool, comfortable. Its fuss-proof bridge provides easy permanent adjustment to any face. Super Armorplate lenses give maximum protection from impact.

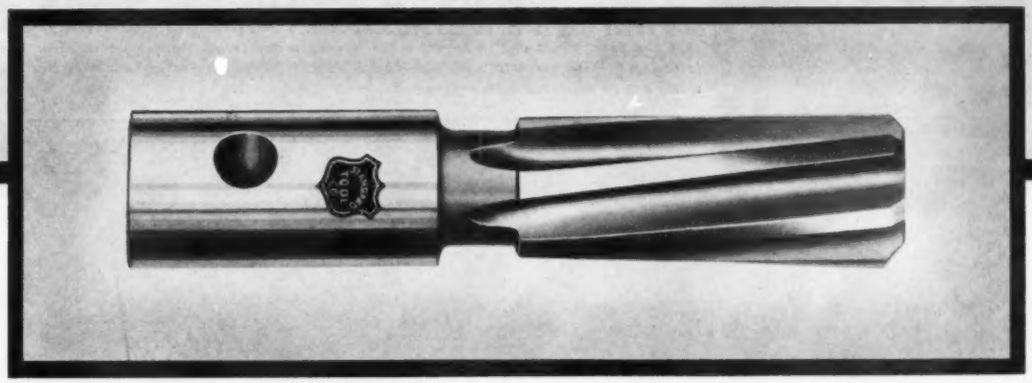
And yet — to close your books against this threatened liability will cost you only a few dollars. And it's done as simply as this: Put a call in, now, for the local American representative. He will survey your plant without disturbing routine — will spot every eye-hazard, including the dangerous unnoticeable ones — and will give you an economical plan of American eye-protection covering every man and his job.

AMERICAN OPTICAL COMPANY

Manufacturers, for more than 100 years, of products to aid and protect vision. Factories at Southbridge, Mass. In Canada, Consolidated Optical Co., Ltd. Branch Offices in all principal industrial centers.

4337

They Can Take It



These stub reamers are designed especially for high speed automatics. Adapted to floating holders they provide the close alignment essential to precision reaming.

THE STANDARD TOOL CO.

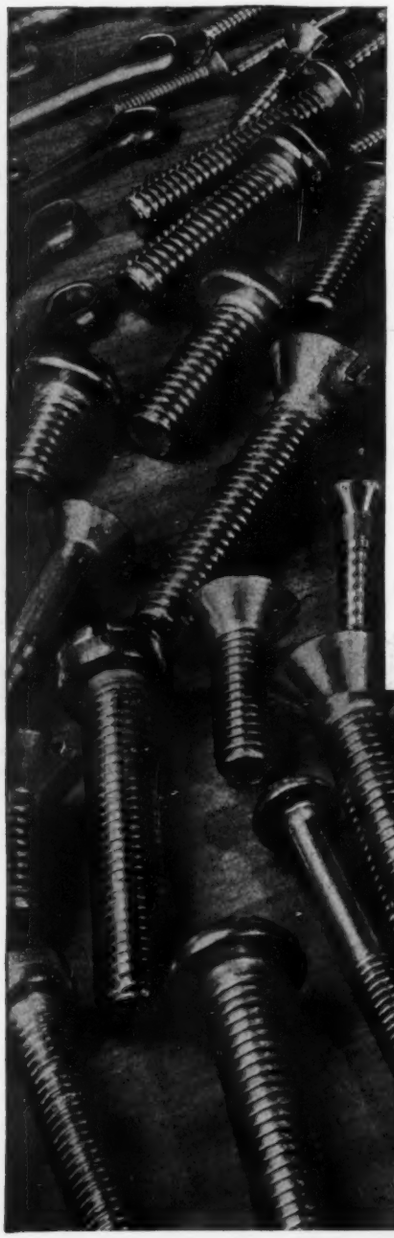
Cleveland

NEW YORK • DETROIT • CHICAGO

TWIST DRILLS • MILLING CUTTERS • TAPS • DIES • REAMERS
DRILL CHUCKS • WHEEL DRESSERS • SPECIAL TOOLS

EVERY ONE

a Stitch in Time



THEY are fascinating little gadgets—these fastenings—fascinating because they are as vitally important as they are absolutely insignificant. Though costing next to nothing, one broken fastening alone can start an appalling train of damage.

The requirements of a good fastening are very simple. It should be strong. It should be permanent. It should be easily removable. Yet until recently there never was a perfect fastening. There never was a fastening which would not rust or corrode or weaken with time; which would not eventually "rust on" tightly.

Today, there is stainless steel. This prince of steels makes possible better fastenings than were available ever before. Screws and nails and bolts and nuts and clasps and cotter pins and clamps and washers and rings and clips and every other kind of fastening. Strong because they are made from one of the strongest metals known to science. Permanent because there is no known limit to the useful life of stainless steel. Always easily removable because they will never corrode, never "rust on," never cement themselves to their surroundings.

One of the best ways to add quality —and a new selling feature—to your product is just to specify . . . "Fastenings of U·S·S Stainless Steel." The extra cost per piece is insignificant. And what a profitable investment if they can prevent just one eventual costly failure in a thousand pieces!

Ask for the names of manufacturers who can supply U·S·S Stainless Steel fastenings at moderate cost.

• • •

AND EVERY ONE IS STAINLESS STEEL *Strong. Permanent. And always easily removable because they can never "rust on." Why not make it your policy to standardize on stainless steel for all small fastenings? With our free machining U·S·S 18-8FM, automatic screw machines can make any pattern which can be machined from ordinary Bessemer screw stock.*

U·S·S STAINLESS STEEL

AMERICAN STEEL & WIRE COMPANY, *Cleveland, Chicago, and New York*
CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
NATIONAL TUBE COMPANY, *Pittsburgh*
Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

you get them all

WHEN YOU INSTALL A

NATCO

SOLVES YOUR "HOLE" PROBLEM

NATCO B-225H DRILLER

- RAPID DRILLING
- EASE OF OPERATION
- DEPENDABILITY
- MINIMUM MAINTENANCE

When you install a NATCO B225H Driller you install a versatile machine which provides all these worth-while advantages.

Rapid Drilling. This machine is provided with a hydraulic feed with pressure enough to push medium sized drills at a high penetration rate. The feeding rate may be changed as desired thru the use of a single valve.

Ease of Operation. Two operating levers are within easy reach of the operator. One lever is used for routine operation of the machine while the other provides an emergency reverse. In addition the second lever may be used for jogging the head for set-up purposes. All unnatural movements on the part of the operator have been eliminated, thus providing easy and positive operation.

Dependability. Several hundred machines of this type, arranged with various sized heads are in operation throughout the world. Many plants have standardized on this type of driller for all their medium sized work.

Minimum Maintenance. The NATCO B225H driller is of simple, efficient and sturdy design . . . making possible its normal operation over long periods with a minimum of maintenance.

The machine shown may not fit your particular needs . . . yet among the many types and sizes there is one, when properly applied to your needs, that will lower your drilling costs. Why not call a NATCO representative and let him aid you in coming to a practical and profitable solution to your "hole" problems?

Chicago Office—2009 Engineering Bldg.
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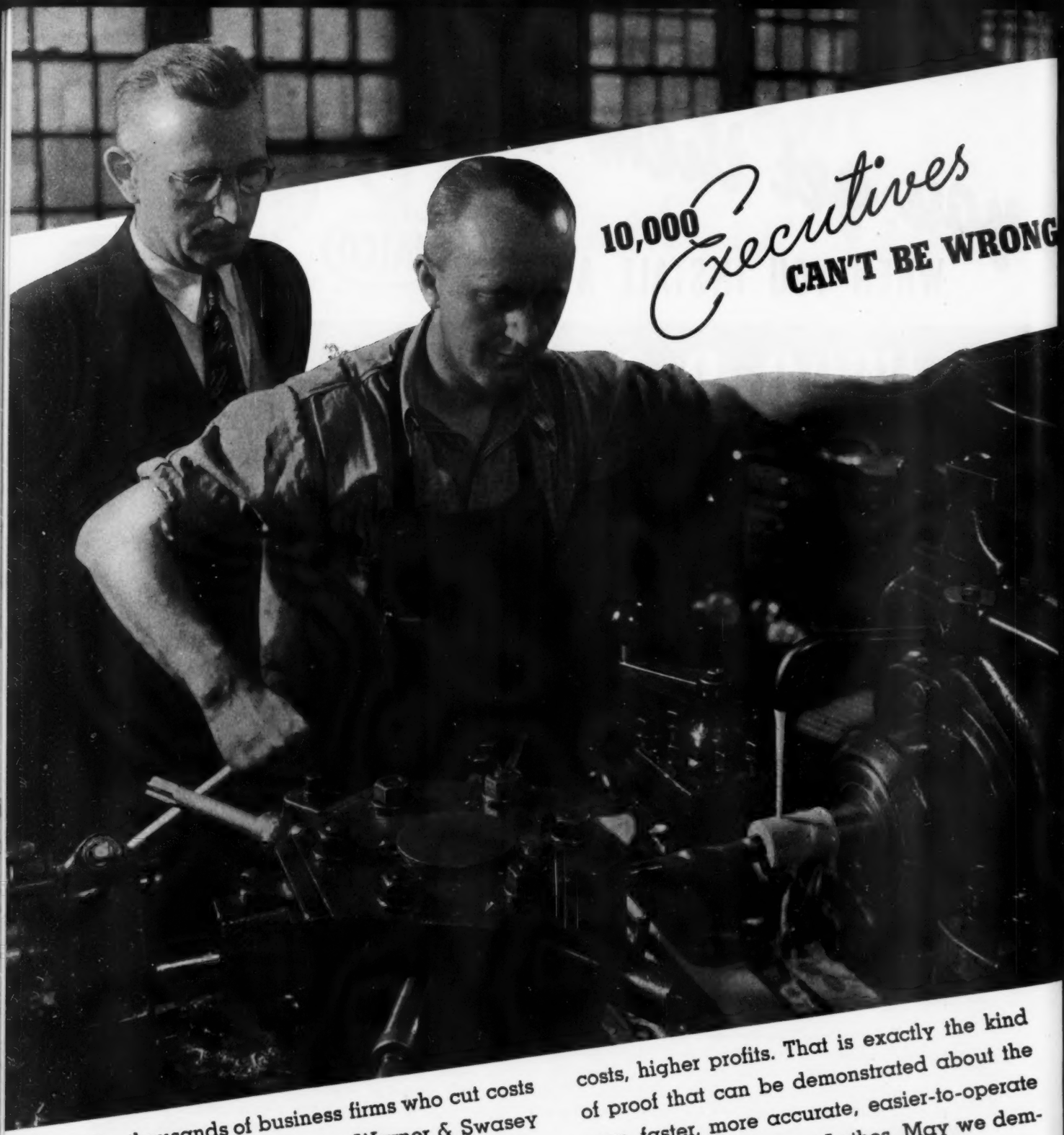
Investigate NATCO Methods for Lower Production Costs!

THE NATIONAL AUTOMATIC TOOL CO.
Richmond, Indiana, U.S.A.

NATCO

Drilling, Boring and Tapping Machines

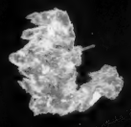


10,000 *Executives* CAN'T BE WRONG

The thousands of business firms who cut costs in the past year with new Warner & Swasey turret lathes and tools would read like a Blue Book of American Industry. The men who decided on these purchases probably totaled 10,000 of the keenest, most analytical and far-sighted executives in the country. They are men who invest only when it can be *proven* to them that the investment will result in lower costs, higher profits. That is exactly the kind of proof that can be demonstrated about the new, faster, more accurate, easier-to-operate Warner & Swasey Turret Lathes. May we demonstrate what these improved machines would do in your shop—and for your net profit?

WARNER & SWASEY
Turret Lathes
Cleveland

You can turn it better, faster, for less— with a Warner & Swasey.



PYROMETER CHECKING The Thwing "Treasure Chest" pyrometer checking set which can be used as a portable potentiometer and to check thermocouples as well as pyrometers, is described in leaflet No. A-3716 offered by Thwing-Albert Instrument Co., 3339-41 Lancaster Ave., Philadelphia, Pa.

SEALED BEARINGS A 20-page booklet entitled "Sealed," offered by New Departure, Div. General Motors Corp., Bristol, Conn., gives the principles involved in the N-D-Seal bearing and discusses the need for this type of self-sealed bearing.

SHAPERS Bulletin No. 57 and Circular No. 210, showing the main features of Ohio shapers, are announced by Bryant Machinery & Engineering Co., 400 West Madison St., Chicago, Ill., exclusive representatives of The Ohio Machine Tool Co., of Kenton, Ohio.

SHOP EQUIPMENT General Catalog No. 28, offered by the Atlas Press Co., Kalamazoo, Mich., shows various items of machine shop equipment.

SNOW PLOW A mailing folder, Bulletin No. 119, being distributed by Easton Car & Construction Co., 10 East 40th St., New York, N. Y., describes the "Silver Blade" snow plow which is designed for attachment to the platform of any high or low-lift industrial truck. Snow can be pushed to either side of the runway or straight ahead with this plow.

SPOT WELDERS R. B. Annis Co., 1505-07 E. Michigan St., Indianapolis, Ind., offers a folder describing the features of Annis spot welders, which are available in bench or pedestal types.

STANDARD TOOLS Standard tools for 1L and 2L high-production turret lathes are listed and described in a 24-page catalog, Form No. 1066, announced by Gisholt Machine Co., Madison, Wis.

STRAPPING Bulkbinding, by means of the Signode tensional steel strapping system for carloading, is discussed in a 20-page booklet offered by Signode Steel Strapping Co., 2608 N. Western Ave., Chicago, Ill.

TEMPERATURE CONTROL "Flexibility in Temperature Regulation" is the title of a folder describing resistance thermometers offered by The Brown Instrument Co., 4501 Wayne Ave., Philadelphia, Pa.

THREADING The No. 14 Geometric threading machine developed for threading duplicate parts in quantity, is described in a 4-page bulletin offered by The Geometric Tool Co., New Haven, Conn. Specifications are listed.

TOOL STEEL Malgaloy shock resisting, non-tempering steel for pneumatic tools and Malga non-tempering tool steel, which is said to be suited for a wide variety of applications, are described in a folder offered by Amalgamated Steel Co., 7831-35 Broadway, Cleveland, Ohio.

VERTICAL MOTORS Bulletin No. 1410, published by Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago, Ill., describes vertical, hollow- and solid-shaft polyphase induction motors.

WETTING OF METALS "The Wetting of Metals by Metals with Particular Reference to Tinning and Soldering," is the title of Technical Publications Series B, No. 6, by E. J. Daniels and D. J. MacNaughtan. This 14-page booklet is offered by International Tin Research and Development Council, 149 Broadway, New York, N. Y.

A machine tool for shearing metal. All-steel construction, accurate, fast, with new gauging methods . . . its very appearance expresses efficiency.

THE CINCINNATI SHAPER COMPANY, CINCINNATI, OHIO

THESE FILES COMPLETE 3 UNITS WHILE OTHERS DO 2

The increased output that a machinist can deliver using Nicholson, Black Diamond or McCaffrey Files lies entirely in the ability of these files to remove more metal.

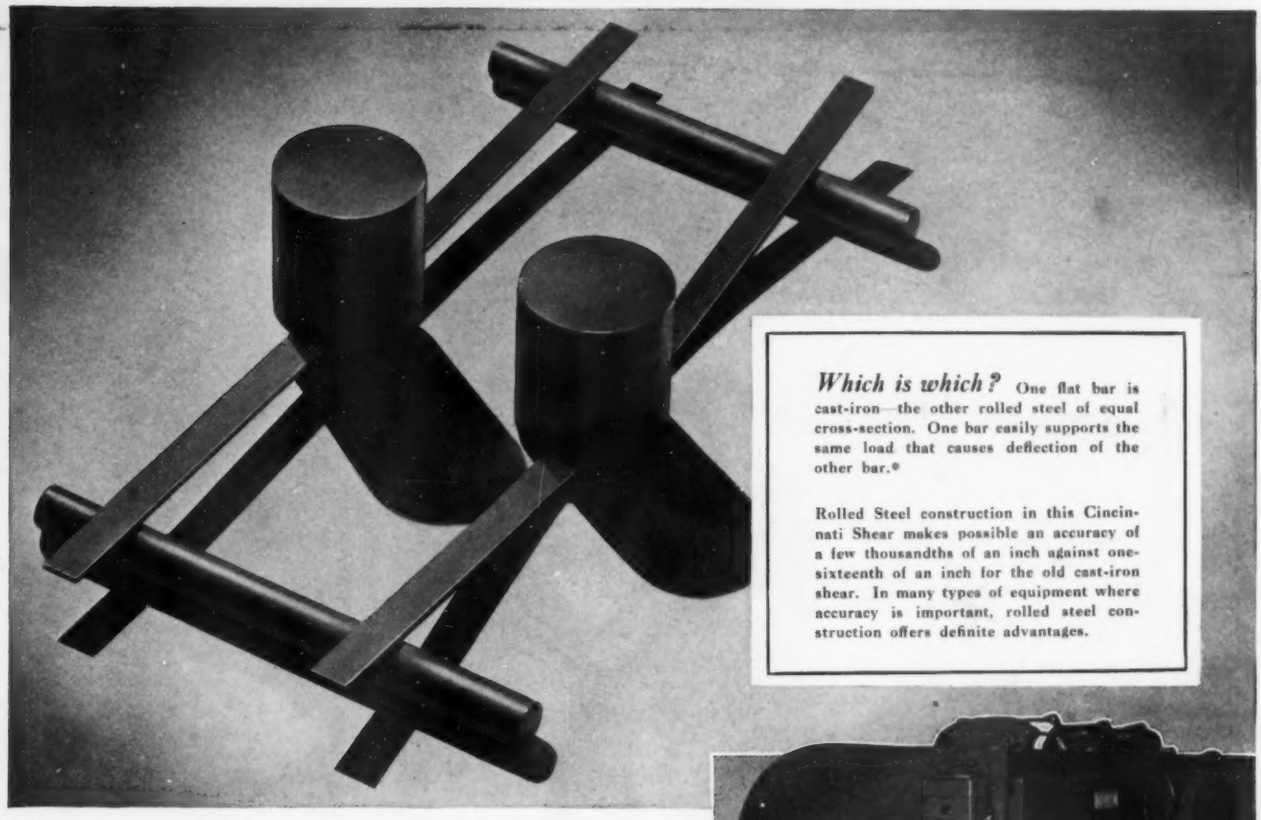
Hand tests on exactly the same metals by the same man show beyond doubt that Nicholson, Black Diamond and McCaffrey Files can complete three units of work while other files finish only two.

There is an increase well worth having . . . an increase that steps up filing efficiency . . . and steps down filing costs.

Buy Nicholson, Black Diamond or McCaffrey Files from your Mill Supply Dealer. Get three units of work done instead of two. Nicholson File Company, Providence, R. I., U. S. A.

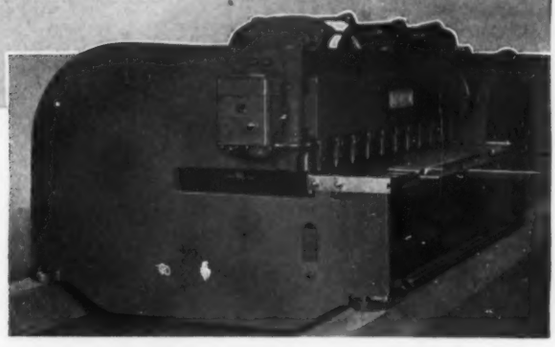
A FILE FOR EVERY PURPOSE

PICTURE TELLS THE STORY



Which is which? One flat bar is cast-iron—the other rolled steel of equal cross-section. One bar easily supports the same load that causes deflection of the other bar.*

Rolled Steel construction in this Cincinnati Shear makes possible an accuracy of a few thousandths of an inch against one-sixteenth of an inch for the old cast-iron shear. In many types of equipment where accuracy is important, rolled steel construction offers definite advantages.



Shows why Rolled Steel Construction makes machinery more rigid... more accurate... less bulky

THE greater rigidity, greater strength, lighter weight and reduced bulk obtainable by rolled steel construction are only a few of the advantages of this modern method of fabrication. Rolled Steel welded construction makes available to designers and fabricators the whole group of metallurgy's finer steels — steels specially developed to resist every destructive force — impact, wear abrasion, corrosion, heat, high pressure, vibration. It permits you to combine various steels, if necessary, into one homogeneous unit.

Here are some of these steels:

U·S·S High Tensile Steels to carry high unit stresses and reduce weight to a minimum.

U·S·S Abrasion-Resisting Steel to reduce abrasive wear and cut down replacements.

U·S·S Steel for Low Temperature Service to provide high impact strength at low temperatures.

U·S·S Heat-Resisting Steel (25-12) to endure temperatures disastrous to other metals.

Special analyses of U·S·S Carilloy Alloy Steels to carry tremendous bearing pressures safely.

U·S·S Stainless Steels to resist corrosive environments.

Remember, too, that rolled steel construction allows the inclusion of steel castings in the design wherever they prove economical. It also enables you to take advantage of a wide variety of special shapes, bars, slabs, pipe, forgings and rolled sections that help to reduce construction costs.

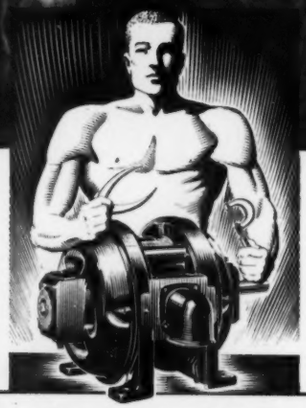
Write us freely about any problem which you feel might be solved by these special steels or rolled steel design.

*The rigid flat bar at the left is rolled steel. By actual test, rolled steel is about 2½ times as stiff as cast-iron.

CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*
COLUMBIA STEEL COMPANY, *San Francisco*
TENNESSEE COAL, IRON & RAILROAD COMPANY, *Birmingham*
United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

"Built from the Inside Out"



G-E MOTORS PASS ALL TESTS

INSULATION "built from the inside out"—like that on the G-E form-wound coil which this motor user is inspecting layer by layer—assures reliable motor performance in your plant. Every coil that goes into a G-E motor—whether random-wound for the smaller sizes or form-wound for medium-sized and large motors—is built to provide long life in your service.

Hundreds of laboratory tests were made in developing the high-bonding-strength varnish, the high-dielectric insulating materials for the slot portion, and the proper methods of application and curing to assure a high-quality insulation assembly. Rigid factory tests assure the proper manufacture of all materials. And, finally, continuous inspections make sure that every coil is made exactly right. At every important step in the manufacture of G-E motors, similarly exacting tests are made, not only to make sure that General Electric quality is maintained but also to find new ways to raise this quality *still higher.*

GENERAL ELECTRIC

020-352

—How G-E Motor Insulation Helps Keep Your Production Moving

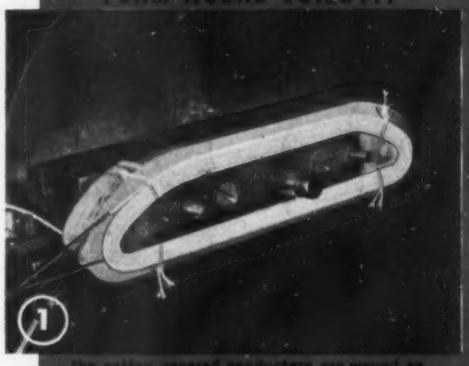
SUPPOSE you were to go into a G-E motor factory and select any standard form-wound motor coil from the production line. Then—like the man on the opposite page—suppose you were to strip back the outer layers of tape and varnished-cambric wrappings to see what is underneath.

You would find that even the innermost cotton covering over the conductors is completely impregnated with G-E insulating varnish. Every pore of the fabric is filled, every thread solidly bonded—evidence of the "built from the inside out" kind of insulation that is a big factor in assuring continuous, trouble-free operation of G-E motors.

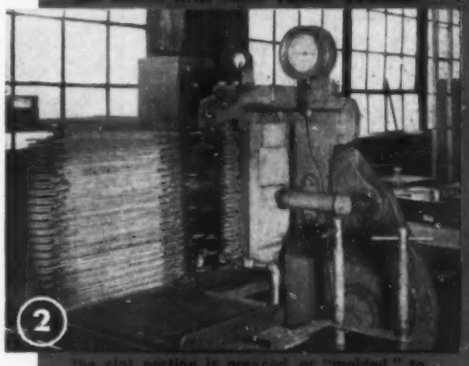
Here's why you can count on longer life from the coils used in G-E motors: They do not depend on a final surface coating of varnish for electrical and mechanical insulation. Such a practice results in only partial impregnation of the inner coverings—imperfect insulation that permits the absorption of moisture and attacks by foreign substances that break down the dielectric strength of the insulation. The effect of such coils in motors is reduced insulation life, production delays, and unnecessary repair expense.

In G-E motor factories, proved manufacturing procedures and continual testing of products prevent such a result. Every form-wound coil is varnish-impregnated and baked at every step in its manufacture. The pictures at the right show how a typical coil is made, to assure longer life. It is this same attention to detail, throughout their manufacture, that makes G-E motors able to Pass All Tests in your service.

IN MANUFACTURING G-E FORM-WOUND COILS...



the cotton-covered conductors are wound on [illegible]. After initial varnish impregnation

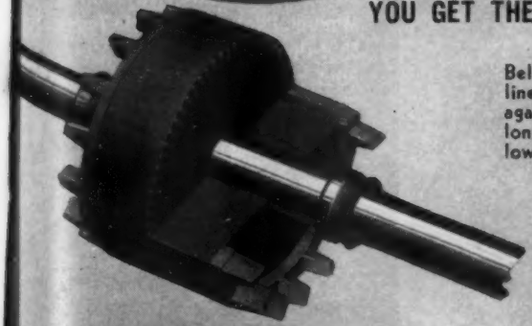


the slot portion is pressed, or "molded," to assure rigidity. The coils are then formed,

wrapped with slot insulation, taped, dipped, and baked. After each dipping, the coils are

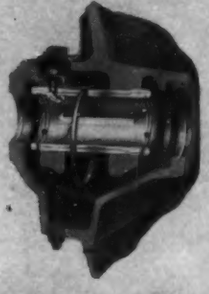
baked in this oven. A final taping, impregnation, and bake complete the process.

YOU GET THESE EXTRA-VALUE FEATURES IN G-E SKELETON-FRAME INDUCTION MOTORS



Squirrel-cage rotor, with indestructible cast-aluminum windings, has integrally cast fans at both ends. There are no joints to cause high-resistance spots

Below—Steel-shell, babbitt-lined sleeve bearings, sealed against dust and dirt, assure long life of bearings and low maintenance costs



This cast-iron skeleton frame is unusually strong and rigid. The high-quality insulation of these form-wound coils means long motor life and low upkeep costs

Below—Strong, cast-iron end shields protect the end windings, permit the entrance of ample cooling air, and assure rigid support for the bearings

STOP WRESTLING WITH THIS

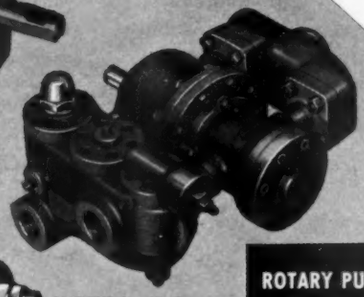
FOUR THOUSAND STANDARDIZED (OIL) HYDRAULIC PUMP AND CONTROL UNITS TO CHOOSE FROM!

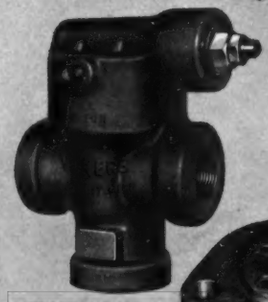
☆

WE HELP YOU COMBINE AND ENGINEER THEM TO YOUR PARTICULAR REQUIREMENTS

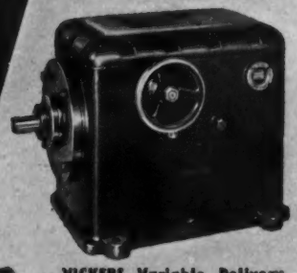
VICKERS Electric-Hydraulic Control Panels are available in several types and sizes.

VICKERS Balanced Vane Type Rotary Pump for continuous working pressures up to 1,000 lb. per sq. in.



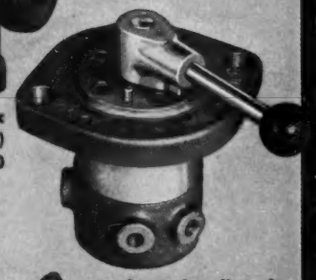


VICKERS Double Pump and Combination Valve Assembly.

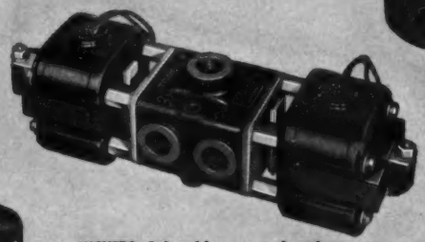


VICKERS Variable Delivery Pumps for working pressures to 2,500 lb. per sq. in.

VICKERS Hydraulic Relief Valve (Balanced) for pressures to 3,000 lb. per sq. in.



VICKERS Balanced Gear Fluid Motor provides efficient and compact variable speed rotary drives.



A complete line of manually and mechanically operated Vickers pilot valves is available.

VICKERS Solenoid operated valves provide direct electrical control where required.

VICKERS Hydraulic Variable Speed Transmission used for wide variety of rotary drives.

VICKERS 3-, 4-, 5- and 6-Way Valves include manual, latch, pilot or solenoid operated.

ROTARY PUMPS
- Constant Displacement
- Variable Displacement
- Balanced Vane Type
- Balanced Gear Type
- Multiple Piston Type

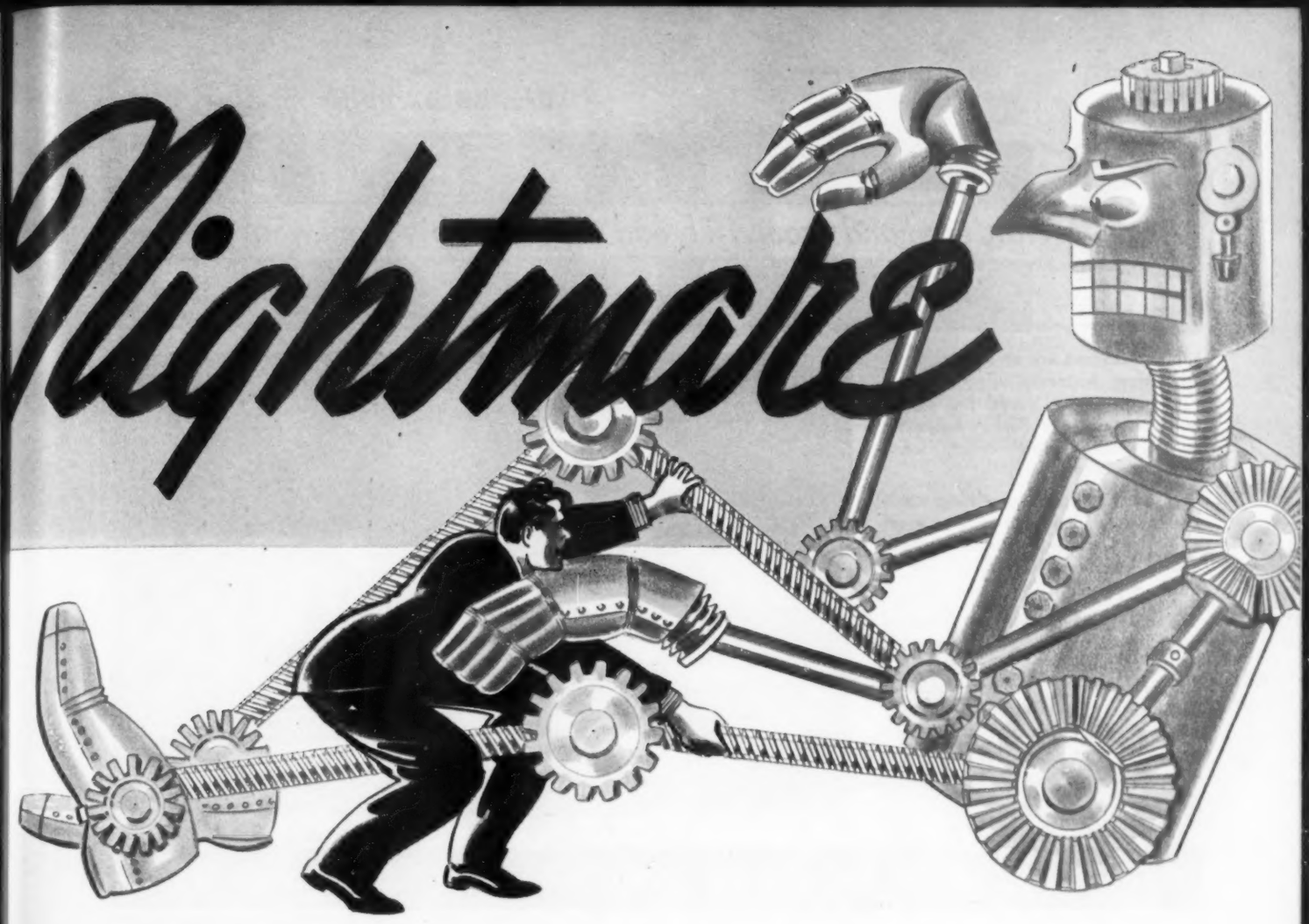
PRESSURE CONTROLS
- Relief Valves
- Unloading Valves
- Sequence Valves
- Reducing Valves
- Pressure Switches

VOLUME CONTROLS
- Adjustable Flow Valves
- Metering Valves
- Flow and Overload Relief Valves
- Deceleration Valves
- Time Delay Valves

DIRECTIONAL CONTROLS
- 2-, 3-, 4-, 5-, and 6-Way Valves
- Manual, Pilot and Solenoid Types
- Shut-Off Valves
- Pilot and Pilot Interlock Valves
- Check and Prefill Check Valves

CONTROL ASSEMBLIES
- Traverse and Feed Panels
- Reciprocation Panels
- Special Purpose Panels
- Multiple Unit Valves
- Accumulators and Power Units

FLUID MOTORS
- Constant Displacement
- Variable Displacement
- Balanced Gear Type
- Multiple Piston Type
- Cylinders



VICKERS HYDRAULIC CONTROL WILL HELP YOU BANISH IT

A nightmarish tangle of screws, cams, bearings, levers, shafts, etc., which mechanical control and drive may involve, can be banished in an instant by adopting Vickers Hydraulic Control. The smooth, silent flow of oil through unobtrusive pipes or tubing replaces many mechanical moving parts which would require additional first cost, lubrication, maintenance, and eventual replacement.

Almost limitless in its flexibility, Vickers Hydraulic equipment is simple, compact, easy to use. It will apply any adjustable force you wish at the place you want it . . . will give you infinitely variable feed or speed rates . . . will provide automatic overload protection for the machine . . . will make possible practically any sequence of automatically or remotely controlled motions when desired.

Vickers equipment is so designed it can be located at the most favorable position on the machine, eliminating control linkages and the necessity of designing the machine around the hydraulic equipment. Vickers Valves and Vane Type Pumps are reliable . . . have a minimum of moving parts . . . are inherently lubricated and inherently balanced against bearing loads.

Using Vickers equipment pays dividends in other ways, too. Many machines are easier to operate, capable of much higher production rates and show longer tool life, through the simple application of Vickers Hydraulic Equipment.

No matter what sort of machinery you deal with, your files should contain data on Vickers Hydraulic Devices. They are standardized stock products.

Write today. Let us know your type of work.

VICKERS *Incorporated* • **1410 OAKMAN BLVD., DETROIT, MICH.**

PERKINS

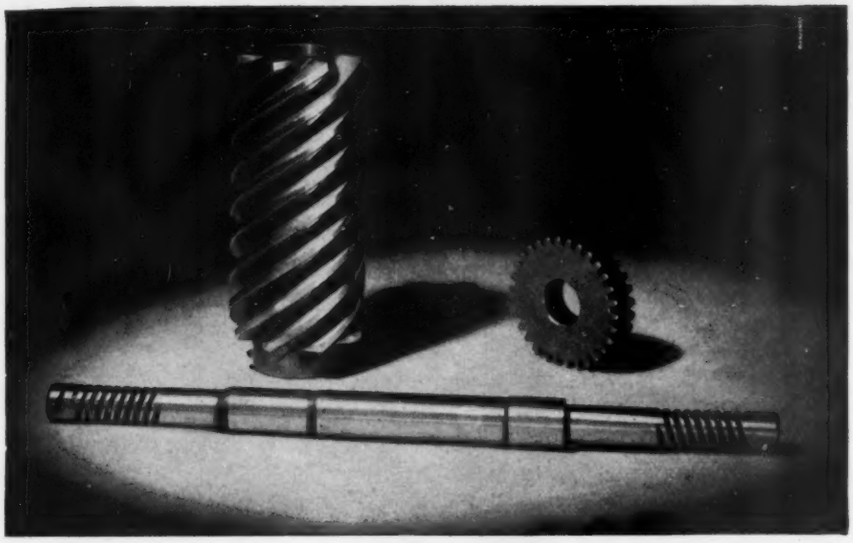
Hardened and Ground-Thread Worms are big Money-Savers

Many instances are on record where customers formerly using a shell-type worm have saved big money by changing to a Perkins hardened and ground-thread worm, made integral with the shaft.

Besides reducing assembling costs, this integral construction also eliminates assembling errors, thereby assuring more uniform quality in the finished product.

We make all types of worm, helical, spiral, bevel and worm gears to meet the buyer's specifications; and our engineers are always glad to cooperate in developing special designs which will give the utmost efficiency and economy.

Write us regarding any present or prospective gear requirement.

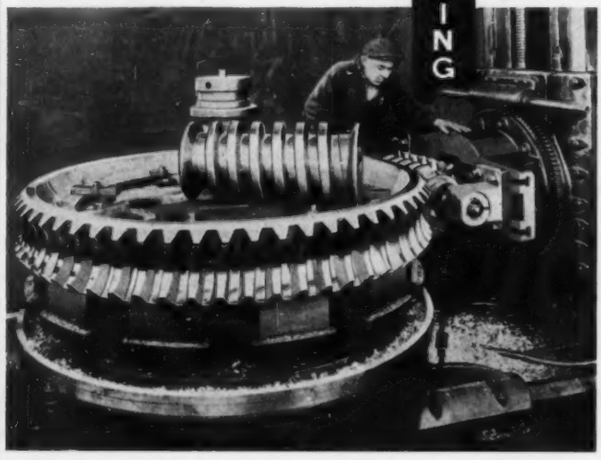


PERKINS MACHINE & GEAR CO., 130 Circuit Ave., Springfield, Mass.

PERHAPS an odd expression—"hair splitting by the ton"—but in Phillie Gear's Shops it's actually an everyday occurrence. Big Gears containing hundreds of teeth—and each tooth exactly like every other tooth within thousandths of an inch. The metal throughout is so perfectly distributed and machined, that the gear (when placed on knife edges) will readily revolve by the slightest push of the hand.

Our catalog tells our story complete—send for a copy.

HAIR SPLITTING by the TON



PHILADELPHIA GEAR WORKS

Industrial Gears and Speed Reducers

Erie Ave. & G St., Philadelphia

—in the smaller range—
having made MILLIONS of
them, we know the tricks

Gear Specialties

INCORPORATED

2635 W. CANTON STREET - CHICAGO

For 20 years this Company has been known as Mechanical Specialties Mfg. Co

GEARS - WORMS - CAMS - MADE TO ORDER

HARTFORD GEARS

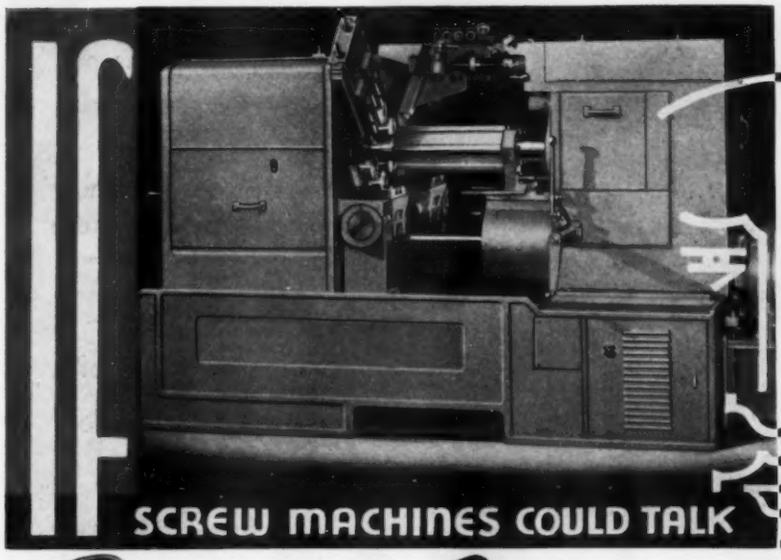
THE HARTFORD SPECIAL MACHINERY CO. Hartford, Conn.

Ganschow

Spur—Speed Transformers—Worm

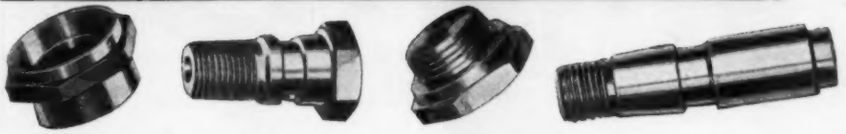
All Types of Cut Gears **4-Speed Positive Drive Reducer**
Silent Laminated Steel Pinions

GANSCHOW GEAR CO., 1013 W. Washington, Chicago



WE invite you to make a trial run of B & L Cold Finished Screw Stock on your automatics, and note the surprising pick-up in machine performance. The stock cuts smoothly at high spindle speeds . . . no chip troubles . . . no excessive wear on the tool . . . no sacrifice of quality. The B & L Open-Hearth grades are developed to give a machining range close to Bessemer . . . while Ultra-Cut, our high sulphur Bessemer type, tops them all for productivity. Operators are enthusiastic about B & L Free-Cutting Steels . . . and the machines themselves give silent approval by their increased output of finely finished parts.

They'd boost..



B L FREE-CUTTING STEELS

COLD DRAWN BARS • GROUND SHAFTING • SCREW STOCK • SPECIAL SECTIONS • ALLOY STEELS

BLISS & LAUGHLIN, INC.

HARVEY, ILL. *Sales Offices in all Principal Cities* BUFFALO, N.Y.

GEARS—GOOD GEARS ONLY

ALL KINDS

At the Right Price

THE CINCINNATI GEAR CO.

CINCINNATI, OHIO

GEARS

Spur - Helical - Bevel - Worms - Screws - Racks
Gear Hobbing - Thread Milling - Broaching

THE ADAMS COMPANY (*Est. 1883*) 1900 Bridge St Dubuque, Iowa

SMALL GEARS

ALSO MEDIUM SIZES IN ALL TYPES AND MATERIALS

Hobbed, Pin Rod, Spur, Spiral and Worm Rod

Massachusetts Gear & Tool Company

25 Nashua St. Woburn, Mass.

EARLE GEARS

Cut Spur, Bevel and Worm Gears

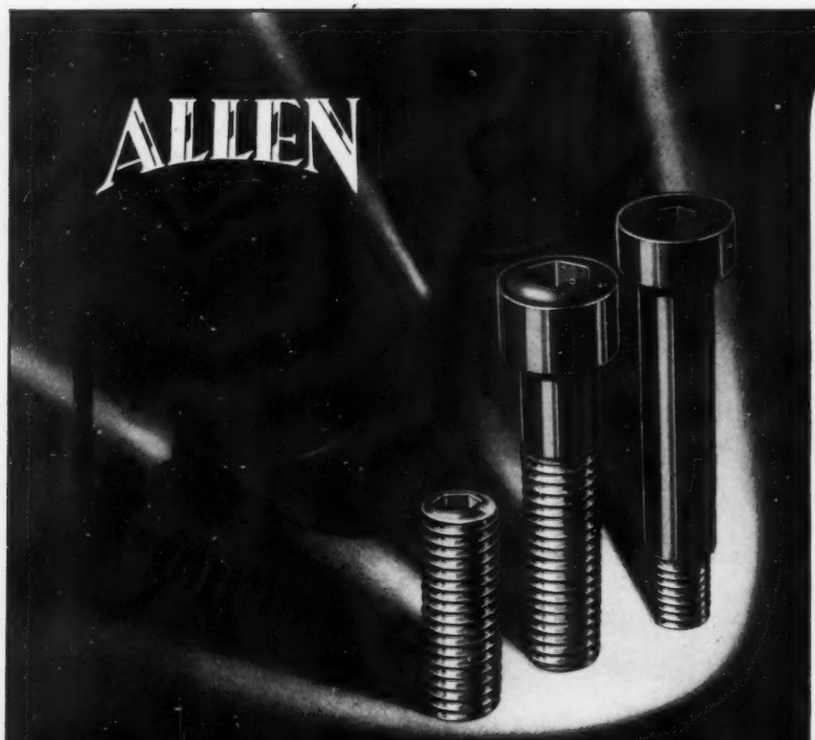
All sizes. Every description. Operating Machinery for Bridges, etc. "Lea Simplex" Cold Metal Saws.

THE EARLE GEAR & MACHINE CO.
4723 Stenton Ave.
Philadelphia, Pa.
110 State St., Boston, Mass.
85 Liberty St., New York City

Sixtieth GRANT YEAR 1877-1937

Grant Speed Reduction Units are positive, economical. Built for both individual or group drives. Complete range of sizes, from fractional to 25 h.p. Reductions up to 4000 to 1.

GRANT GEAR WORKS—BOSTON



Questions subordinated to SERVICE - records

Most every buyer of hollow screws used to ask these questions:

— *how* are they made?

— *where* are they made?

— *what* are they made of?

— *who* makes them?

Today, a first-time buyer of hollow screws may ask those selfsame questions.

But the experienced user asks for "Allens" — and furthermore *asks no questions!*

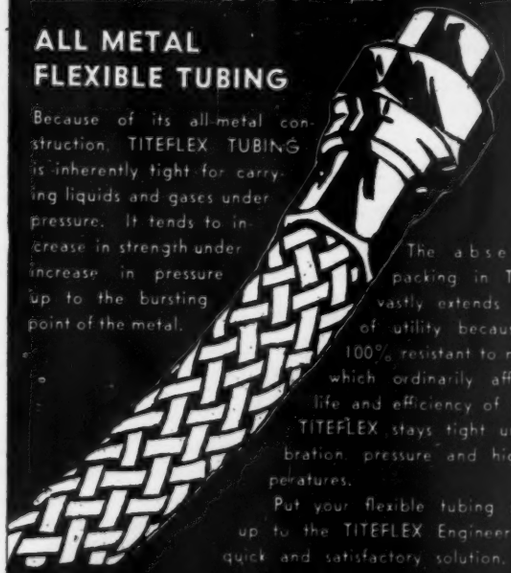
THE ALLEN MFG. COMPANY
HARTFORD, CONN. U.S.A.

He Means **REX-WELD** *the One-Piece Sealed Steam Connection*

• Rex-Weld stands on its performance: unlimited flexing life, seep-proof under pressure, non-deteriorating, perfect absorption of vibration or motion of moving parts, take-up of torsion, simplicity of installing and no care after installation—a super-service record made possible by the Rex-Weld new and exclusive process of one-piece balanced strength construction. Get the facts from **Chicago Metal Hose Corporation, Maywood, Illinois (Chicago Suburb).**

Tite flex
REG U S PAT OFF

ALL METAL FLEXIBLE TUBING



Because of its all-metal construction, TITEFLEX TUBING is inherently tight for carrying liquids and gases under pressure. It tends to increase in strength under increase in pressure up to the bursting point of the metal.

The absence of packing in TITEFLEX vastly extends its field of utility because it is 100% resistant to materials which ordinarily affect the life and efficiency of packing. TITEFLEX stays tight under vibration, pressure and high temperatures.

Put your flexible tubing problem up to the TITEFLEX Engineers for a quick and satisfactory solution.

TITEFLEX METAL HOSE CO.
494 Frelinghuysen Ave. • • Newark, N. J.

AGAIN UNBRAKO steps ahead with a New Idea!

This time it's

UNBRAKO

SELF-LOCKING HOLLOW SET SCREW

Heretofore there has never been a positive way of locking a Set Screw; yet if it works loose there's no telling what may happen.

We licked the problem by simply knurling the two top threads of the "UNBRAKO," as shown.

This knurling raises sharp prongs all around the edge of the thread which dig right into the threads of the tapped hole when the "UNBRAKO" is being tightened up, so it can't possibly work loose.

Tests have proven and our customers, who have already bought about 2,000,000 of them, corroborate that the "UNBRAKO" *Self-Locking Set* positively won't budge once it's tightened up.

Send for Free Sample.

Fig. 1564
Pat. Applied for

STANDARD PRESSED STEEL CO.

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JENKINTOWN, PENNA.
Box 4

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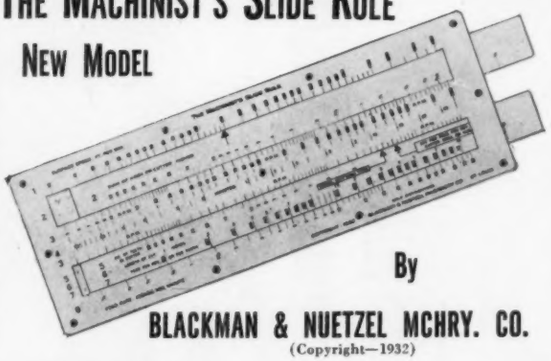
THE MACHINIST'S SLIDE RULE

NEW MODEL



By

BLACKMAN & NUETZEL MCHRY. CO.

(Copyright—1932)

MACHINISTS,

Tool-Up and Time Study Men,
Production and Sales Engineers,
Increase your value & Efficiency with

THE MACHINIST'S SLIDE RULE

A Direct Calculator for the Shop Man. It makes clear the definite relations between

SPEED, FEED, CUT, TIME AND POWER

and solves quickly the correct combinations of these basic elements in Turning, Boring, Milling and Drilling operations. Determines the POWER REQUIRED and the TOTAL CUTTING TIME.

Also checks simple Arithmetic with the Standard A-B Scales.

USERS of the first introductory lot of 500, DEMAND more by the dozen.

NEW MODEL, IMPROVED DESIGN

A nice instrument
All celluloid, Vest Pocket Size with LEATHER CASE & BOOKLET of instructions and valuable data.

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PRICE, COMPLETE $3.50

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Send via Parcel Post ——— Machinist's Slide Rules with leather case and booklet to,

Price each $3.50 _____

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FAST · · ACCURATE · · EASY TO OPERATE

Produces the famous Sellers Drill Point—recommended by leading drill manufacturers. Capacity 1/16" to 1/2" twist drills. The unique Sellers chuck and method of grinding never before offered in a grinder for small drills. Built-in motor. Push button control. Alemite lubrication. Streamlined compactness. Plus every convenience and safeguard for high production capacity in the hands of skilled or unskilled workmen. And at a price that places this grinder in reach of every machine shop. Write for Bulletin M-12.

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If you have a tough cleaning problem . . . one that has been troubling you for some time . . . isn't it worth the price of a postage stamp to get the answer to it?

For 30 years we have been successfully helping industry solve difficult cleaning problems . . . improve quality, establish economies, turn out work faster. Either we already know the answer to YOUR PROBLEM . . . or our Technical Research Laboratories soon will find it for you.

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Industrial Cleaning Materials and Methods

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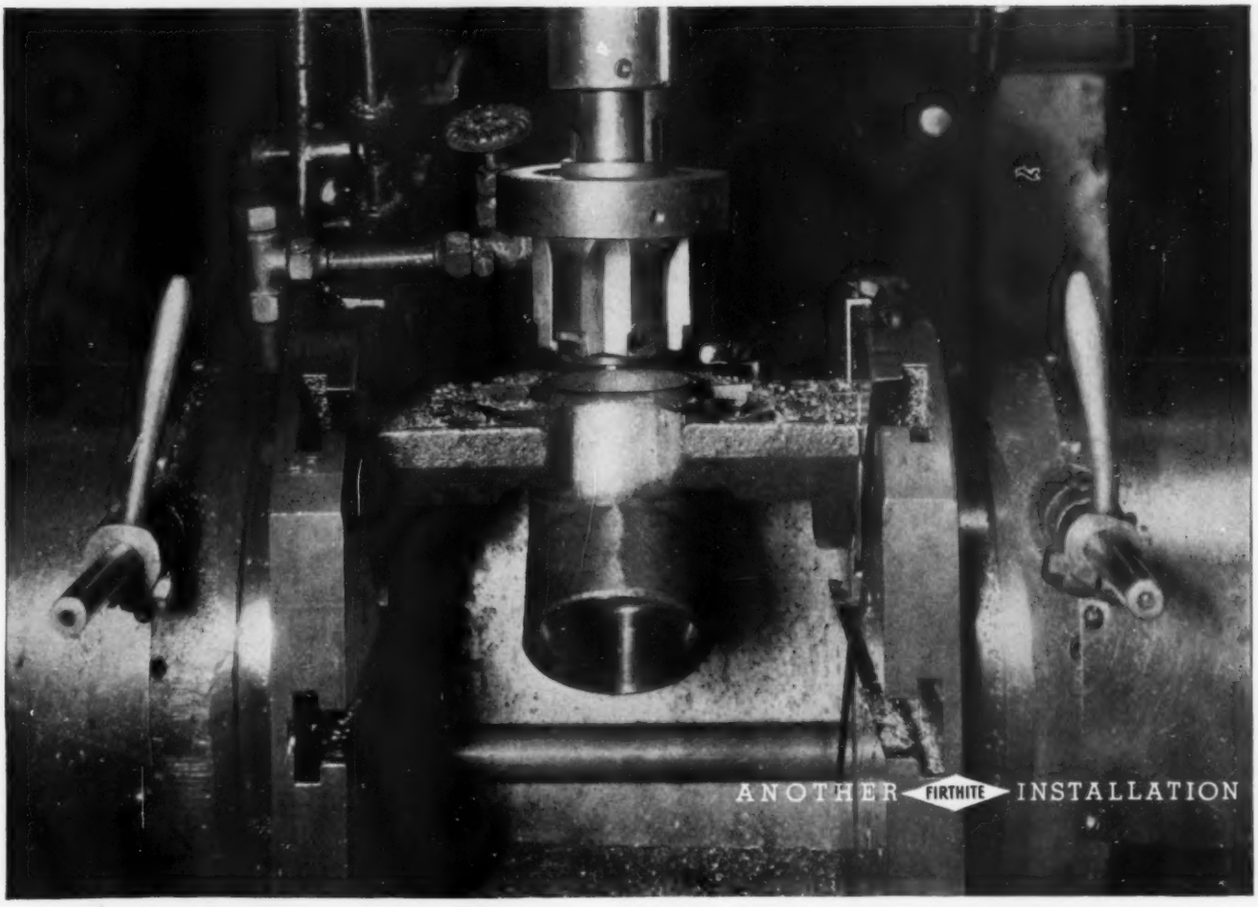

◆FIRTHITE◆

PRODUCES ◆ 80,000 ◆ PIECES

In a large plant using FIRTHITE on 85 per cent of all boring, turning, milling and reaming operations, the Works Manager says, "FIRTHITE is the most economical cutting material available." The FIRTHITE Tool shown above, boring heads of large cast-brass pipe fittings, has six FIRTHITE teeth that finish the bore to size, and one adjustable FIRTHITE Tipped blade that faces and forms the edge of the casting.

This boring is done at:
Speed of 400 feet per minute.
Production 5000 pieces per grind.
80,000 pieces per tool life.

This FIRTHITE Tool set-up is just one of many hundreds of Profit making FIRTHITE installations. Consult us for specific information on possible FIRTHITE applications in your shop.

FIRTH◆STERLING
STEEL COMPANY

Works: McKEESPORT, PA.
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SELF~SEALED

"7000" Series

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SUPERIOR

BECAUSE OF THE FOLLOWING ADVANTAGES:

Thick, closely-fitting felts, providing extra protection.

Effective labyrinth formed by felt seal and plates against recessed inner ring.

Felt seal removable in its entirety—for inspection, cleaning or renewal of grease.

Felt seal entirely within confines of both rings and therefore not exposed to injury.

Seal construction avoids race distortion, assuring dimensional exactness and quiet running.

Wide, solid inner and outer rings with maximum contact on shaft and housing, making inserts in housing unnecessary and militating against slippage, looseness and escape of lubricant past outer ring.

Grease capacity ample for long periods of service.

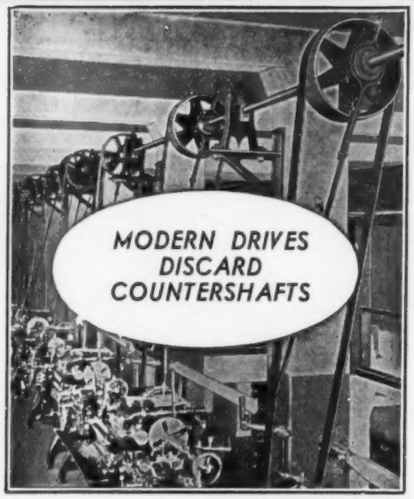
Write for the Catalog describing the Most Complete Line of Self-Protected Bearings in America. Let our engineers work with yours.

"NORMA-HOFFMANN"

PRECISION BEARINGS

NORMA-HOFFMANN BEARINGS CORP'N., STAMFORD, CONN. U.S.A.

THE JOHNSON FRICTION CLUTCH

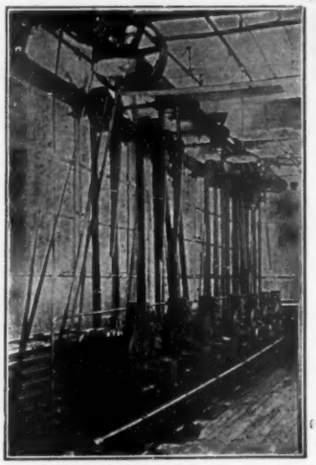


Note these "MODERN GROUP DRIVES"

MODERN GROUP DRIVE PTC

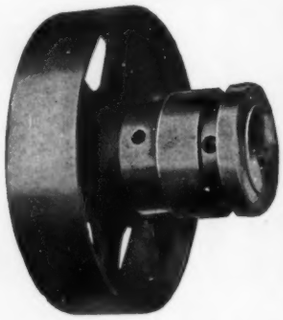
See how machines are driven direct from line shafting through Johnson Friction Clutches—a clutch for every machine. Any machine can be started and stopped at will while producing machines only are in operation. That means savings in power, in machines and in transmission equipment.

Install Johnson Friction Clutches on your line shafts and insure a quick, smooth, 100% controlled "Modern Group Drive." Write for details.

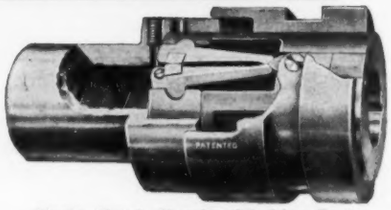


Group of seven automatic sawing machines all driven by Johnson Single Clutches on line shaft in the plant of R. Wallace & Sons Mfg. Co., Littleton, N. H.

JOHNSON EQUIPPED LINESHAFT AT THE NATIONAL SCREW & MFG. CO. CLEVELAND, OHIO.



Single Clutch with Pulley



Single Clutch Showing Working Parts

WRITE FOR BLUE CATALOG No. 125

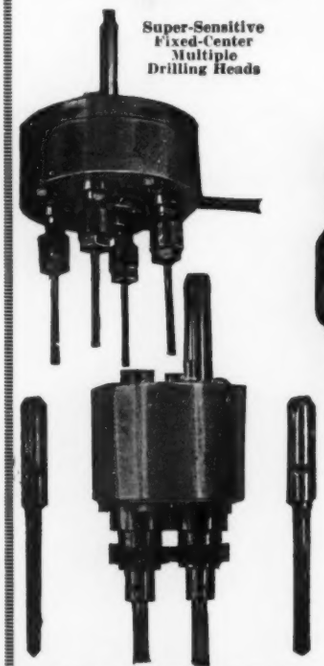
THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

ERRINGTON

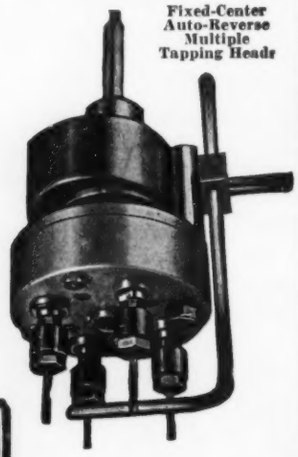
STAPLETON, STATEN ISLAND, N. Y.

MULTIPLE HEADS

Super-Sensitive Fixed-Center Multiple Drilling Heads



Fixed-Center Auto-Reverse Multiple Tapping Heads

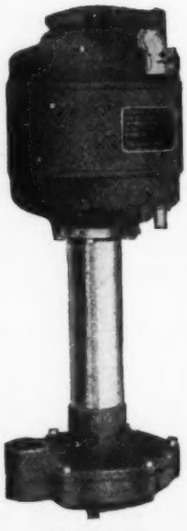


Quick-Change Drilling and Tapping on Reversible Drill Press.

Light - Weight, Super - Sensitive, Durable and Quick Handling for High Speed Production of Interchangeable Parts.

"Many Holes at Cost of One."

90 LEADING MACHINE TOOL BUILDERS SPECIFY RUTHMAN GUSHERS BECAUSE



MODEL T L

for ONE thing . . .

THERE ARE NO FOOT OR RELIEF VALVES

"Fewer parts—less repairs" is a well known maxim among men who know machines. GUSHER Pump construction is simplicity itself. No foot or relief valves are necessary—due to the automatic priming feature of Gusher vertical construction—yet there is no leakage. RUTHMAN GUSHERS pump by centrifugal force—the most trouble-free method. Specify Gusher. Write for catalog.

Consider a few more of our
"19 REASONS WHY"

Simplicity of construction • Can be throttled without building up pressure • Design lengthens bearing life • No dirt can reach bearings • Built-in conduit box • Full year's unconditional guarantee • No mechanical packing or its equivalent required.

THE RUTHMAN MACHINERY CO.
CINCINNATI, OHIO
"Standard and Special Pumps for Every Job!"

MAKE YOUR TABLE-TALK WIN YOU FURTHER INVITATIONS
DO YOU HAVE TO TALK ABOUT THE WEATHER?
DOES YOUR BOSS DRUM ON THE TABLE WHEN YOU TALK IN MEETINGS?
HOW'S YOUR COME-BACK?
CAN YOU SAY IT WITH GRACE AS WELL AS TO GRACE?
DO YOUR BUSINESS ASSOCIATES THINK OF YOU AS A GOOD TALKER?
HAVE YOU A GOOD LINE?

Make them say "You said it!"

How often do you gain heart-felt approval of what you say? How effective is your everyday conversation? Are people won over to you when you talk?

Because relations with people are so large a part of your daily life, in business and social activities, the ability to talk is your most important asset in keeping these relations smooth and in winning people over to your ideas. And the better you talk, the greater will be your success.

"I say without hesitation, this is the best book on conversation ever written." — ALBERT EDWARD WIGGAM

"Will help all who wish to be able to carry on an interesting conversation." —*Liberty*

How to acquire the ability to talk— *readily entertainingly convincingly*

Are people won over to you when you talk? They will be if you understand and apply the technique of conversation. This book is a brass-tack analysis of talk today—its principles—its techniques. It is a fascinating, practical discussion of simple exercises which will improve everyday conversation.

How would you work out these problems?

—How would you keep up the interest of a group for fifteen minutes in a topic selected by you? (See page 28)

—How would you discover a special interest of a person you have met for the first time? (See page 74)

—What steps would you take in a talk with just one other person to insure his wanting to talk with you again? (See page 111)

—How would you start, keep moving, and control the conversation at a dinner party of six? (See page 149)

10 days' Examination

Send this Coupon

Milton Wright's

THE ART OF CONVERSATION

And How to Apply Its Technique

Already in its fourth big printing—$2.50

IF you would win an argument or win a wife, cultivate a friend or humble an enemy, get information or give it, ask a favor or deny one, land a job, sell a bill of goods, be elected to office—if you would accomplish anything, at work or at play, where you are in the presence of other human beings, then you must talk.

So that you may learn how to talk to the best advantage in any situation, Milton Wright has written this book. He shows you—not merely tells you, but *shows* you—how to start a conversation, how to keep it going, how to direct it the way you want it to go, how to make precisely the impression you want to make and get exactly the result you want. He analyzes repartee and shows you how to develop facility in using it. He takes actual conversations apart and shows you what makes them tick.

Mr. Wright's book is firmly grounded in psychology and is written in his easy-to-read style. You can't help setting yourself in the places of the people who do the talking, and when you've laid down the book, you want to go out and practice on your friends. It's a fascinating book—interesting, practical, and really helpful.

TRY WRIGHT'S METHODS FREE

Check the list of conversational offenses on page 320; see how plainly Wright shows how to overcome these faults. You can make this test, read Wright's book, put his method right into practice, without obligation, simply by mailing the coupon. Take this practical way to see just what the book offers you. Mail the coupon today.

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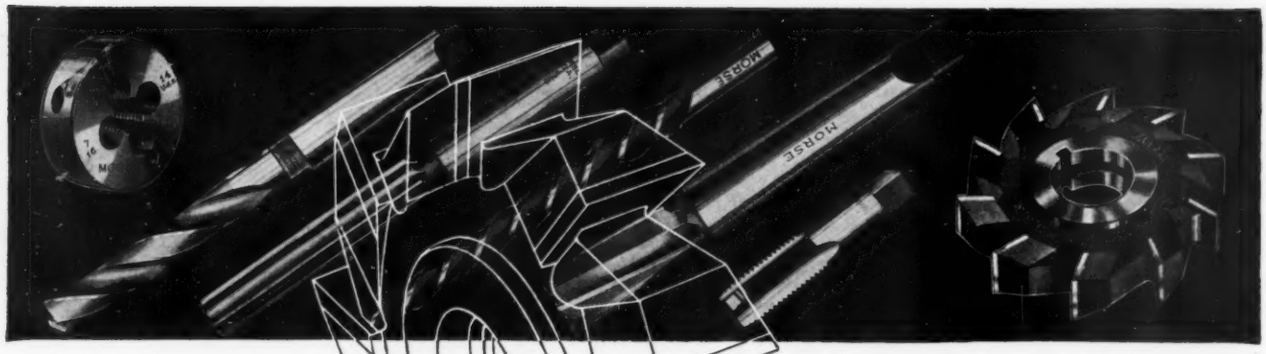
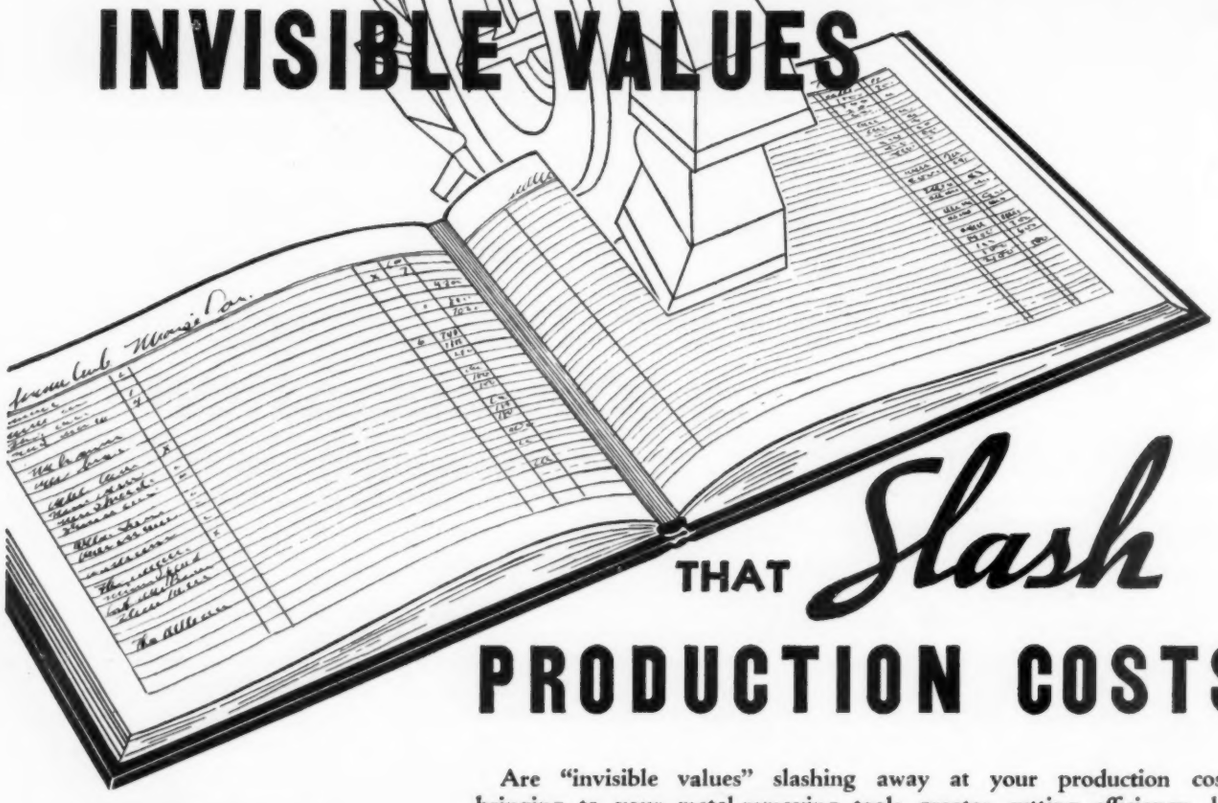


INVISIBLE VALUES



THAT *Slash* PRODUCTION COSTS

Are "invisible values" slashing away at your production costs, bringing to your metal-removing tools greater cutting efficiency, less breakage, longer time between resharpening?

They are if you use Morse Tools. The "invisible values" are Morse Extra Values — hidden superiorities in every tool that bears the Morse trade mark. In putting them there, years of manufacturing experience play a part. So does carefully-controlled heat treating. Unusually accurate grinding. Step-by-step inspection.

Do you have doubts about a difference between various brands of metal-removing tools? Then let Morse extra values prove themselves in your own shop. The Morse laboratory, with many years of tool engineering experience, will co-operate on any problem.

A Conveniently Located Morse Distributor
Will Give You Prompt Service

The Morse Line includes:
High Speed and Carbon

DRILLS
REAMERS
CUTTERS
TAPS AND DIES
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MORSE THERE IS A *DIFFERENCE* TWIST DRILL & MACHINE COMPANY
NEW BEDFORD - - - MASS., U. S. A.

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If you are interested in equipping your automatic screw machines with the

ONE TOOL THAT REPLACES 14 SEPARATE TOOLS

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THE ONLY RIGHT AND LEFT HAND COMBINATION TURNING TOOL ON THE MARKET

R&L TOOLS, 1825-27 Bristol St., Nicetown, Philadelphia

You may send complete information and prices on the R&L Combination Turning Tool to:

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CARD

Ground Thread High Speed Steel

Machine Screw Taps

No. 1121 Regular

No. 1123 Spiral Pointed

Features . . . Furnished in taper, plug and bottoming styles.

Commercial ground to tolerances shown in Catalog 33, page 33.

Cut back relief.

Made in sizes Nos. 4 to 14, inclusive.

Recommendations . . . For high production tapping where accuracy must be controlled.

Use No. 1121 Regular for screw machine tapping and for blind holes, No. 1123 Spiral pointed for through holes in all metals.

The big demand for these taps indicates that you should get better acquainted with them.

Sold by leading dealers Everywhere

Send for circular on design and recommended uses of CARD Machine Screw Taps.

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Mansfield, Mass., U. S. A.
DIVISION OF UNION TWIST DRILL CO.

STORES: NEW YORK: 61 Reade St. DETROIT: 6540 Antoine St.
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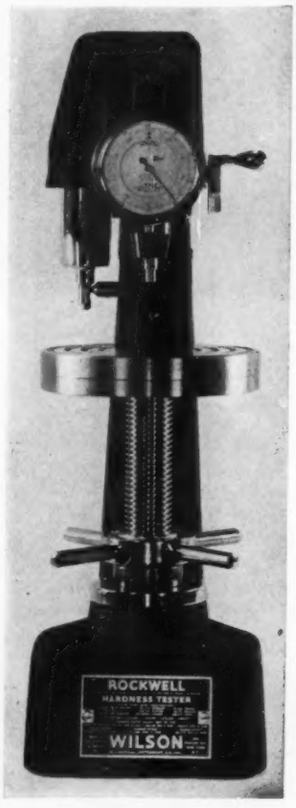


"ROCKWELL" HARDNESS TESTER

Wherever good tools are made, whether in job shops or in the tool rooms of large plants, there you will find one of these indispensible machines. It is accurate, as it must be, because it is made with precision and care.

Here we illustrate the usual tool room equipment.

WILSON
MECHANICAL INSTRUMENT CO. INC
736 E. 143d St.
New York, N. Y.

DOES NOT MAR THE SURFACE
BASA Hammer
STRIKES A SURE POSITIVE BLOW WITH NO DAMAGE TO SURFACE STRUCK.

In finishing and assembly work it is often desirable to use a hammer that can strike more than one kind of blow.

Rawhide, Copper and Babbitt Faces can be inserted in head by simply loosening nut.

Any combination can be secured by the quick adjustment of the necessary faces.

Faces Cannot Rattle in Head, or Fall Out

The clamping jaws of the "BASA" Hammer can be set up to take care of shrinkage or wear of the Faces.

Made in Five Sizes

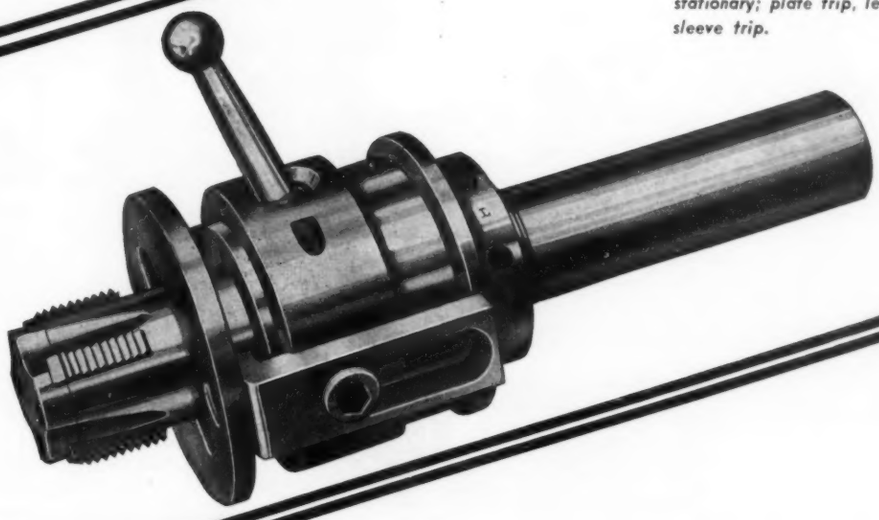
A soft-faced hammer of improved design and construction.

HAMMERS AND FACES ARE MADE IN U. S. A.

Send for full particulars.

GREENE, TWEED & CO.
SOLE MANUFACTURERS
109 DUANE STREET, NEW YORK

Collapsing Taps—



The Class S Collapsing Tap, for general tapping work—rotary or stationary; plate trip, lever trip or sleeve trip.

by Geometric

THESE collapsing taps save you money, time and trouble — and cut better screw threads. The elimination of backing-off increases production and prevents damage to threads. Removable chasers are quickly and accurately resharpened, giving longer life and lower costs. Simple, precise adjustments allow for wear and sharpening and provide uniform accuracy throughout the run. And a single tool will cut a wide range of sizes, each size requiring only a separate set of chasers, which costs less than most solid taps.

Notice the sturdy, simple design of the Class S Tap. The chasers are rigidly supported in hardened and ground slots, yet ample chip space is provided, and adjustments are quick and easy. The positive tripping action prevents accidents. Precision methods of manufacture insure the greatest accuracy. The tool is convertible for rotary or stationary tapping, with hand, lever or plate trip. Send for our booklet on the Class S Tap.

THE GEOMETRIC TOOL COMPANY
NEW HAVEN, CONNECTICUT

GEOMETRIC

GOLD SEAL (TYPE H) LATHES

THE OUTSTANDING LATHE IN THE MEDIUM PRICE FIELD

16″ x 6′ Gold Seal Lathe—$1,935.00
20″ x 8′ Gold Seal Lathe—$2,550.00

Including 3 phase motor and all regular equipment as shown. Illustration shows 20″ x 8′ Gold Seal Lathe built in 12″, 14″, 16″, 18″ and 20″ sizes.

Due to ease of handling these lathes will take most work and turn it out with speed and accuracy. The outstanding lathe of medium price, quality built throughout. Heat treated and hardened steel gears, exceptionally wide feed and thread range, precision alignment, Timken Bearings in headstock, and made flexible with many new, modern features.

CHROME HARD LEAD SCREW

● **THE** lathe in the medium priced field.

52 years of experience

The SEBASTIAN LATHE *Company*
CINCINNATI, O. U. S. A.

WALKER
MAGNETIC CHUCKS

No. 617 bar pole magnetic chuck. Specially suitable for holding small and thin work. Sizes from 6″ x 10″ up to 12″ x 60″.

Turn setting up time into Production time

● Walker Magnetic Chucks turn setting up time into production time, and result in savings of from 20 to 50% in chucking labor by eliminating slow-acting jigs and fixtures for metal removing operations on lathes, shapers, drill, presses, planers, grinders, etc. At the same time they reduce spoilage losses. Many types—write for Catalog W3.

O. S. WALKER CO., INC.
WORCESTER, MASS.

Get the genuine MAUSER VERNIER CALIPER

Measuring Accurately to .001″, Outside, Inside and Depth. Range, 5-5/16″

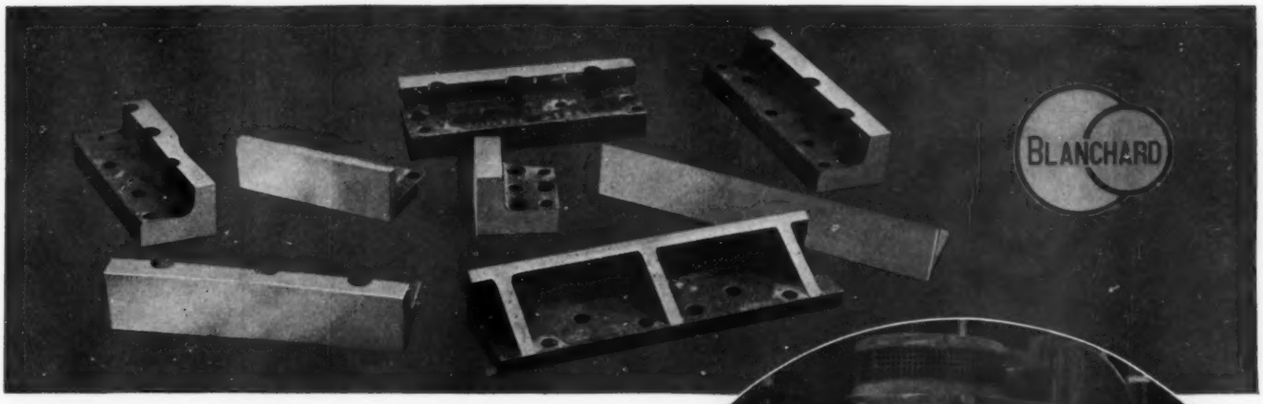
Never before was such close, dependable precision measuring, such versatile application and downright handiness, and such beautiful finish, offered at so low a price. Genuine Mauser Vernier Calipers give you: ● Finish equal to that of the most expensive precision tool. ● Graduations of microscopic exactitude, clean and easy reading. ● All parts of special chrome steel, forged, thoroughly hardened—scale parts spring-hard, measuring surfaces and points, glass-hard. ● A tool which gives that sense of certainty in measuring, essential to speedy and profitable production.

There can be no substitute for accuracy. Get the genuine Mauser Vernier Caliper. Order now—ten days trial money-back offer.

A COMPLETE LINE

of fine measuring tools. Shop agents wanted. Write for the catalog.

GEO. SCHERR CO., 126 Lafayette St., New York, N. Y.



Tool and Die Work

in great variety ground with speed and safety.....

Speed — because a variety of work can be quickly handled without loss of time between jobs.

Safety — fast grinding without burning die, because of high work speed—ample water supply—and ability to use soft free cutting wheels.

The pictures show the No. 18 Blanchard Surface Grinder, with power traverse of table, waterguards opening at front, and push button control for all motions. Descriptive catalog will be sent on request.

THE BLANCHARD MACHINE COMPANY

64 State St.,

Cambridge, Mass., U. S. A.

VITRIFIED

Keep production on its toes by standardizing on . . .
VITRIFIED GRINDING WHEELS

The Vitrified complete line includes also Silicate, Shellac and Resinoid bonded wheels for conditions requiring high finish, elasticity and heat resistance.

Vitrified Wheels

Grinding equipment—for tools or for production requirements—can be brought to higher degrees of precision and speed by standardization of Grinding Wheels.

These objectives can easily be realized through the use of Vitrified Wheels for every grinding operation, because Vitrified offers a complete line of sizes, shapes and types, processed especially for the work to be handled.

. . . Cast Iron, Bronze, etc., can be ground at low cost and efficiently on Vitrified Carborite Wheels.

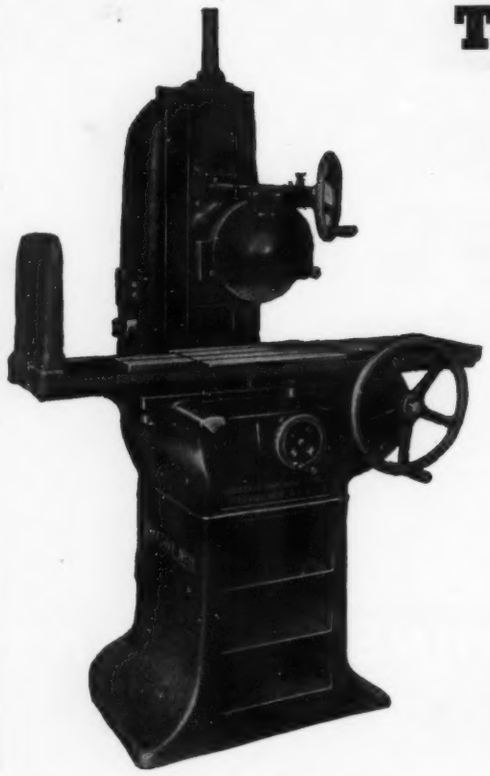
. . . for accurate, fast grinding of steel on a production basis, Vitrified Borite Grinding Wheels increase output and reduce costs.

. . . Also, make Silicate, Shellac and Resinoid Bonded Wheels.

Ask a Vitrified representative to show you how economically you can modernize your grinding operations by standardizing on Vitrified Wheels.

VITRIFIED WHEEL CO.
WESTFIELD MASS.

THIS IS THE ANSWER!



How to take care of those innumerable one and two piece jobs of all sizes and descriptions, the grinding of which ties up larger and more expensive machines.

ABRASIVE NO. 1½ SURFACE GRINDER

A hand operated machine, easy to operate, sensitive and as accurate as your micrometer. The capacity of this machine is 50% greater than the usual small Surface Grinding Machine. Ten inches of cross-feed and 12" under a 12" diameter wheel!

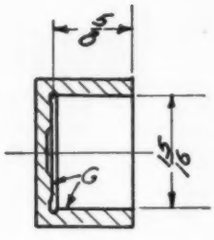
The motor being mounted directly on the spindle saves the use of other moving parts and assures the transmission of the full power of the motor.

Individual Motor Driven Exhaust Attachments or Wet Grinding Attachments can be supplied as accessories with these machines, also Magnetic Chucks, Demagnetizers, Vises and Dial Indicators.

Write for Circular

ABRASIVE MACHINE TOOL CO.
EAST PROVIDENCE, RHODE ISLAND

WHILE HIS BACK IS TURNED

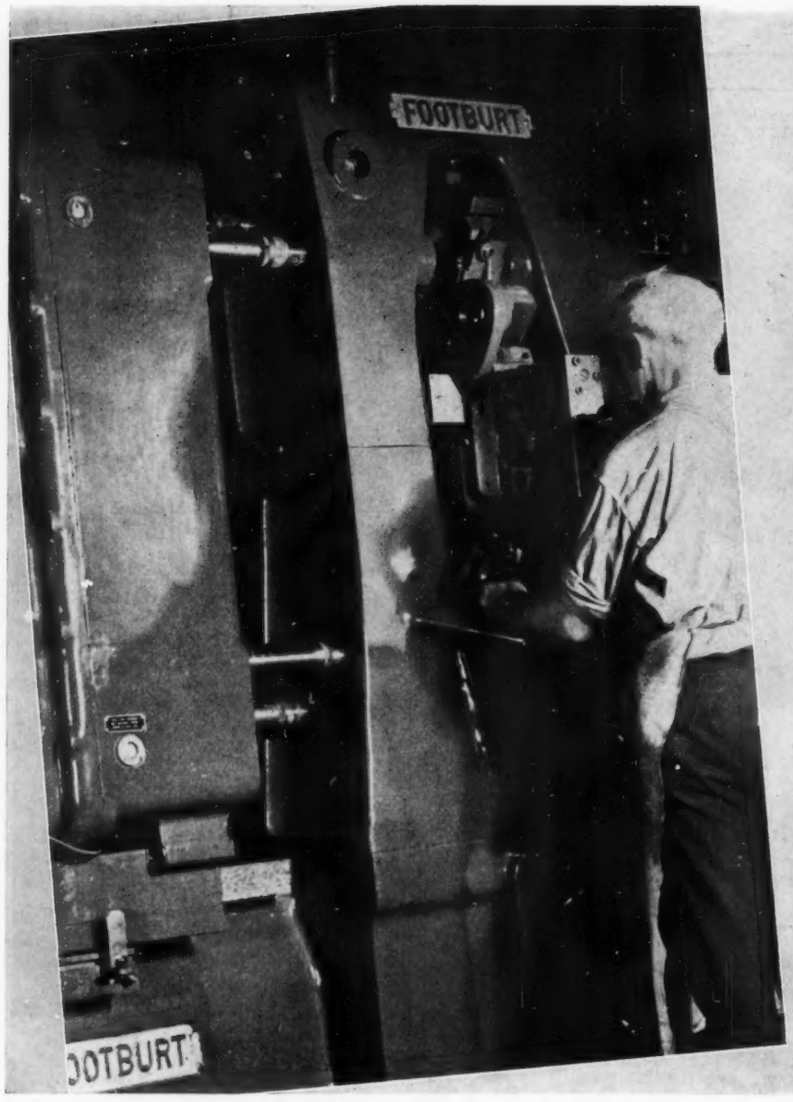


NO DANGER OF WORK BEING SPOILED • • •

BRYANT GRINDERS are arranged with automatic sizing which is universal for blind, taper and straight open holes. This sizing device relieves the operator of the necessity of hand plugging or watching a visual gauge. The wheel automatically separates from the work when the hole is finished to the desired size. The illustration shows a battery of 18 Bryant No. 4 Grinders. On this job each operator runs 2 machines.

BRYANT

Chucking Grinder Company Springfield, Vermont, U. S. A.



Special Machines *for* Varied Operations

FOOTBURT machines are built around the work to be done and special applications as handled by this 25-Ton machine were made for drilling, boring and milling operations. The machine is fully automatic, the indexing being accomplished with FOOTBURT type indexing arrangement.

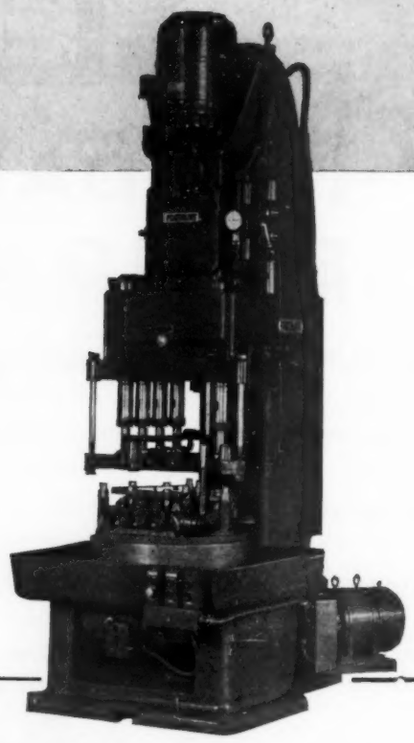
THE FOOTE-BURT COMPANY

CLEVELAND, OHIO

Detroit Office:
4-151 General Motors Bldg.

Chicago Office:
565 Washington Blvd.

FOOTBURT



Automatic indexing machine for operating on high grade plier handles

This is what a MACHINE TOOL MOTOR - Must do !

Precision is the key word in practically all machine-tool operations — because it definitely involves the elements of production and cost control.

Therefore, a machine-tool motor must be sufficiently free from vibration to assure maximum precision — otherwise spoilage or production delays will result. . . . .

Century Type SC Squirrel Cage Polyphase Induction Motors are designed to assure you all the benefits of precision . . . They are used as standard equipment on "standard-package" grinders, sold by some of the most prominent manufacturers in the country.

Specify Century Motors for your Machine-Tool jobs. . . . . .

CENTURY ELECTRIC COMPANY
1806 Pine Street • • • St. Louis, Mo.
Offices and Stock Points in Principal Cities

SIZES UP TO 600 Century MOTORS HORSE POWER

"LOWEST *cost per* THREAD"

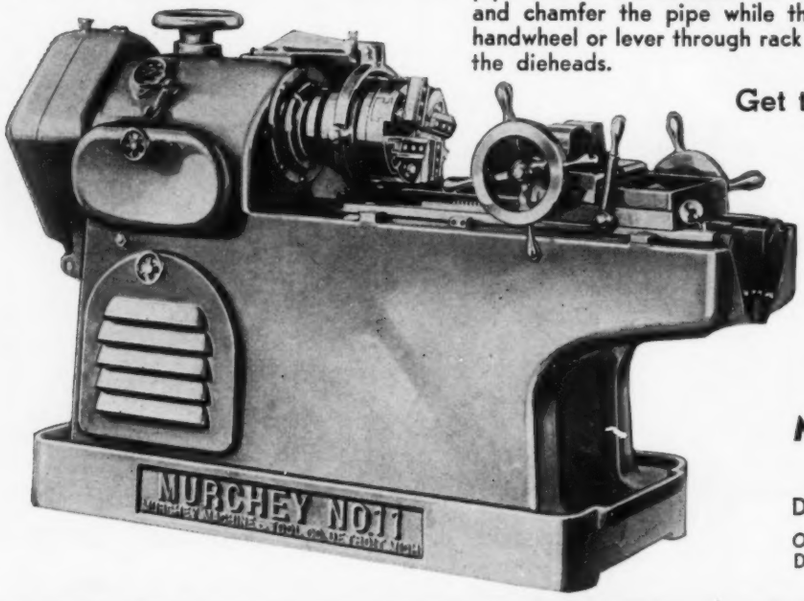
MURCHEY

No. 11 and No. 22

THREADING MACHINES

This new series of Threading Machines are strictly modern machine tools. They are new in design.

Speeds are adjustable and can be increased while the motor is running. Opening and closing of the dieheads is accomplished by the forward or back movement of the carriage. Dieheads used on machines to thread pipe are of the RECEDING TYPE with inside trip, arranged to ream and chamfer the pipe while threading. The carriages are operated by handwheel or lever through rack and pinion, which at the same time closes the dieheads.



Get the special BULLETIN No. A.M.

Tangential Chasers designed to produce the greatest number of grinds per set with the highest degree of accuracy are used.

CAPACITIES

No. 11—Single Head (illustrated): from ¼" to 1½" machine threads; from ⅛" to 1" pipe threads—made in single or double head types.

No. 22—from ½" to 2" pipe; from ½" to 2½" machine and belt threads . . . made in single or double head types.

MURCHEY MACHINE & TOOL CO.

DETROIT MICHIGAN

Other Products: Collapsible Taps, Self Opening Die Heads; Double End and Pipe Cutting-Off Machines

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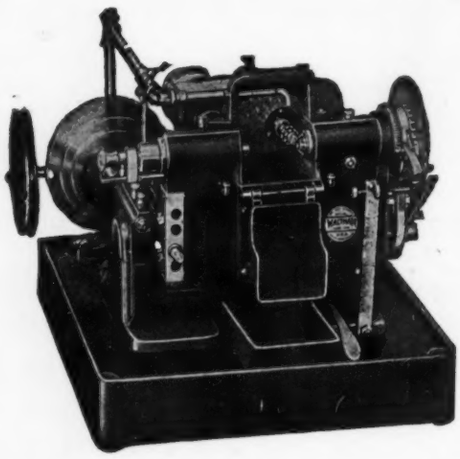


WALTHAM PINION CUTTERS

FOR ACCURACY AND HIGH PRODUCTION

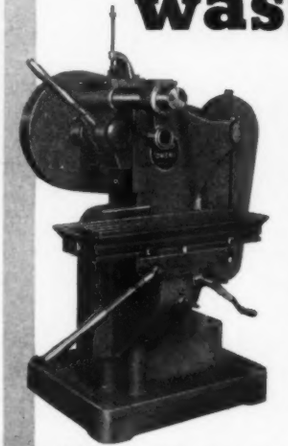
These results are obtained by careful construction and up-to-date design that reduces unproductive time to a minimum. The 1½ in. machine will handle work from the size of watch pinions to 32 pitch gears. A magazine feed for the work can generally be used for pinions either hollow or staffed, and with it the work changing time is only a fraction of a second. The 4 in. machine will cut up to 16 pitch and can be furnished with an individual motor drive.

WALTHAM MACHINE WORKS

HIGH STREET . . . . . WALTHAM, MASS.

MAN HOURS ARE RAW MATERIAL

do you waste them?



Man hours are raw material which every manufacturer must use. They are the easiest of all raw materials to waste—have no scrap or salvage value.

Kent-Owens Millers save man hours—produce more per operator per hour. Flexibility, speed, ease of handling, easy set-up, are reducing floor to floor time in hundreds of plants.

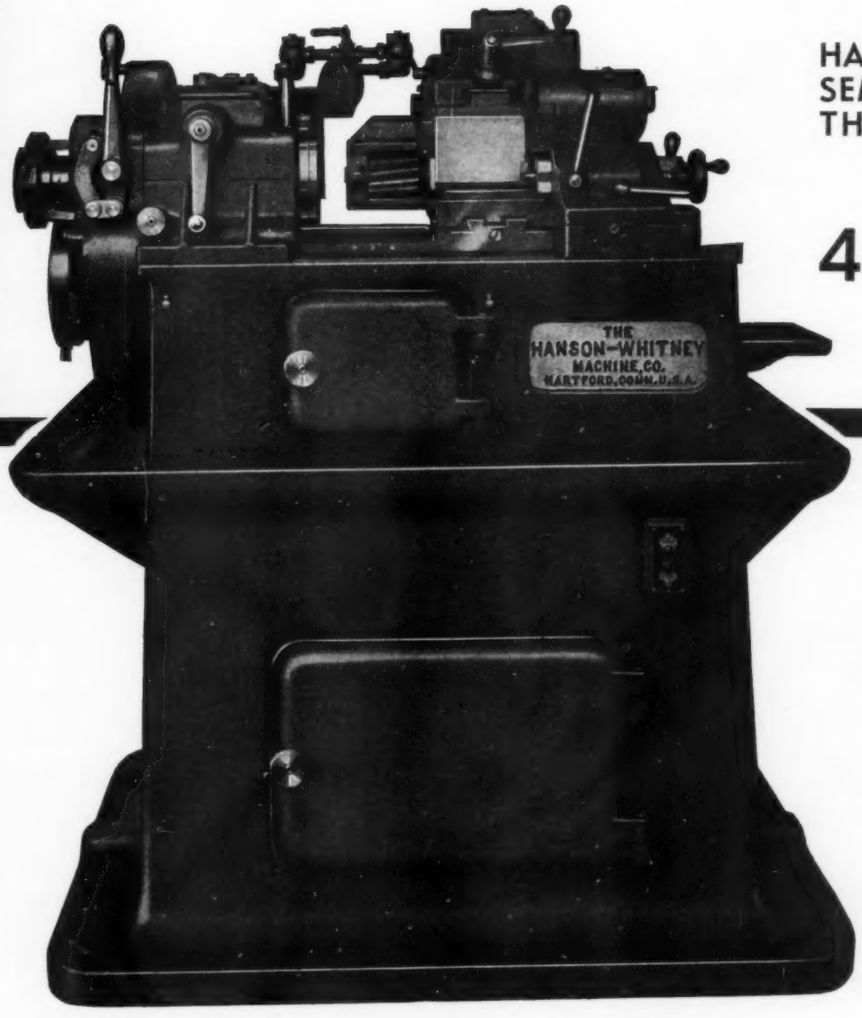
Write for literature on these money saving Milling Machines.

KENT-OWENS MACHINE CO.

958 Wall Street **Toledo, Ohio**

KENT OWENS

Profitable Production
ECONOMY *and* PRECISION!



The
HANSON-WHITNEY SEMI-AUTOMATIC THREAD-MILLING MACHINE

4 x 9 INCHES

Here is a high grade, modern machine for the accurate milling of threads on a profitable production basis. Ideal for milling straight or taper threads, internal or external, right or left hand.

Specifications

Length of Bed	33″
Hole through Spindle	2″
External Capacity 4″ diameter with 2″ Hob	
Internal Capacity 4″ diameter with 2″ Hob	
Internal Capacity ¾″ diameter with ½″ Hob	
Shank Hobs have No. 6 Jarno Taper	
Floor Space	37″ x 48″
Weight	2845 lbs.

Complete with 2 motors, Regular Headstock with draw-back Collet Mechanism and 2″ Master Collet, Tailstock Cutter Head with Arbor and Arbor Support, and one Lead Cam for any pitch specified.

THE HANSON-WHITNEY MACHINE CO.
HARTFORD, CONN.

DOMESTIC REPRESENTATIVES

MACHINERY and SMALL TOOLS—Cincinnati, Ohio, Seifreat-Elstad Mchy. Co.; Dayton, Ohio, Seifreat-Elstad Mchy. Co.; Detroit, Mich., Berry Thomas; New York, N. Y., L. C. Biglow & Company, Inc.; Pittsburgh, Pa., William K. Stamets; Houston, Texas, Wessendorf, Nelms & Co.; Toronto and Montreal, Canada, Arthur Jackson Mche. Tool Co.; Rochester, N. Y., A. G. Brice.

MACHINERY ONLY—Chicago, Ill., Marshall & Huschart Mchy. Co.; Cleveland, Ohio, William K. Stamets; Philadelphia, Pa., Lloyd & Arms, Inc.

SMALL TOOLS ONLY—Chicago, Ill., M. Ray Pearce; Cleveland, Ohio, George A. Whalon; Milwaukee, Wisc., George M. Wolff, Inc.; Philadelphia, Pa., General Tool Sales Co.

SAVE TIME . . cut costs and do a better job with *the* . . .

HARTFORD TRIPLE-ACTION CUTTING BARREL

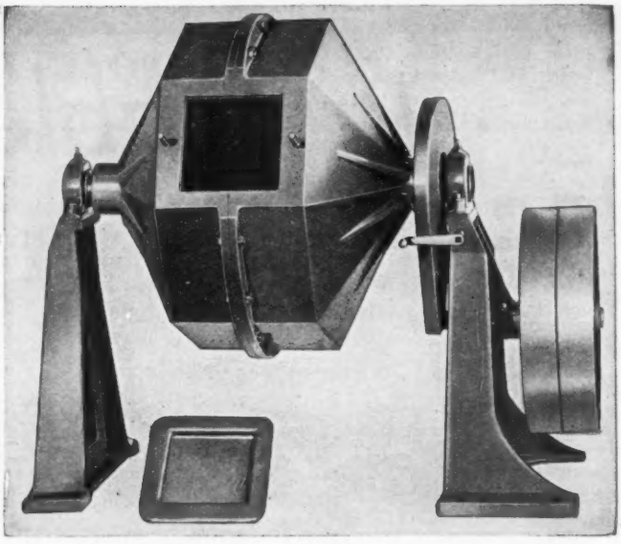
• This recent development by Hartford engineers offers outstanding advantages over hand finishing operations.

A multiple, quick grinding action is produced by the unique shape of the barrel. Material is turned over and over, end to end, and folded in by a TRIPLE ACTION which grinds off burrs and finishes and smooths the surface of every article in the load.

The new HARTFORD Cutting Barrel is a time and cost cutter on many operations. It is ideal for mixing, tumbling, pulverizing, etc., and is particularly efficient and suited to wet grinding (or sand rolling) because the speed and direction of action insures a quick and thorough job at lowest cost.

This new Hartford Barrel is available for both belt and built-in motor drives.

It will pay you to look into the possibilities offered through the use of the Hartford Triple-Action Cutting Barrel and its advantages over your present hand method. Send for illustrated Bulletin, giving full details.



Production stepped up more than 30 times!

In one plant, a Hartford Barrel is finishing 3000 small castings in the same time it formerly took to finish 90 pieces by hand. Think what such a saving would mean to you!

THE HARTFORD STEEL BALL CO.
HARTFORD CONN.

the MARVEL all-ball-bearing Automatic Production Sawing machines have created a new standard for practical sawing speeds.

This is the blade that has made modern high speed sawing possible

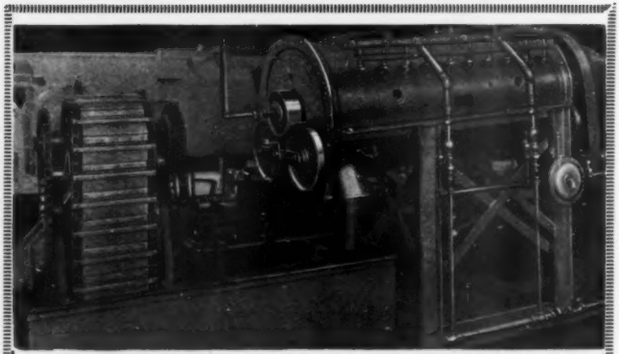
Because they are strictly high speed (have a cutting edge of 18% Tungsten High Speed Steel) and at the same time are *positively unbreakable*, MARVEL High-Speed-Edge Hack Saw Blades have made heavy duty, high speed, automatic production sawing machines practical.

On any equipment, they permit with safety, higher running speeds and greater feed pressures, and will always assure more cuts per dollar.

Write for Circular

MARVEL
HIGH-SPEED-EDGE HACK SAW BLADES

Armstrong-Blum Mfg. Co.
"The Hack Saw People"
5747 N. Bloomingdale Ave., Chicago, U. S. A.



CONTINUOUS GAS CARBURIZING

Hopper feed—automatic discharge

This continuous Gas Carburizing Equipment is excellently suited for applying a thin, uniform case on a wide variety of small parts such as screws, pins, chain links, etc., etc.

The mechanical feed, continuous passage of work through the retort and automatic discharge into an Automatic Quenching Tank insure uniform results.

Write for reprint describing the result being obtained by one user of this equipment which is now supplied in various sizes.

American Gas Furnace Co.
Elizabeth, New Jersey

SEARCHLIGHT SECTION

EMPLOYMENT : BUSINESS : OPPORTUNITIES : EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

10 cents a word, minimum charge $2.00.

Positions Wanted (full or part-time salaried employment only) ½ the above rates, payable in advance.

(See ¶ on Box Numbers)

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads. Replies forwarded without extra charge.

Discount of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 Inch	$6.25
2 to 3 inches	6.00 an inch
4 to 7 inches	5.75 an inch
8 to 14 inches	5.50 an inch

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page. *Contract rates on request.* A.M.

Copy for new advertisements must be received by Monday 10 a.m. to appear in the issue out Wednesday of the following week

POSITIONS VACANT

WANTED: Machine shop foreman for modern plant employing 125 hands. Applicant must be progressive, diplomatic and capable of producing results. State age, nationality, salary expected and complete record of previous employment. P-330, American Machinist, 330 West 42nd Street, New York City.

PRODUCTION MANAGER WANTED by manufacturer of special machinery and machine tools, capable of planning and controlling production, and coordinating operations of different manufacturing departments. Must have mechanical and engineering training, and the ability and personality to accomplish results efficiently and harmoniously. To the right man this is an unusual opportunity, in congenial surroundings. Location New York State. Give full particulars as to experience and responsibilities, with whom and for how long; also age and compensation expected. Communications considered confidential. P-331, American Machinist, 330 West 42nd Street, New York City.

WANTED: Superintendent small parts manufacture near New York. College trained engineer experienced operation high speed machine tools, time study, hardening, finishing, tool making, designing, costs. Send complete information, photograph, references, salary wanted. P-332, American Machinist, 330 West 42nd Street, New York City.

(POSITION VACANT)

MECHANICAL ENGINEER & DESIGNER

with practical experience for manufacturing plant in the East, developing new machinery. Good position for capable man.

P-320, American Machinist
330 West 42nd St., New York City

(POSITION VACANT)

SUPERINTENDENT

for medium size manufacturing plant in Philadelphia. Must have practical experience in building up to date machinery and in handling men. Steady position with good salary for right man. Position open now.

P-310, American Machinist
330 West 42nd St., New York City

EMPLOYMENT SERVICE

SALARIED POSITIONS, $2,500 to $25,000. This thoroughly organized advertising service of 28 years' recognized standing and reputation carries on preliminary negotiations for positions of the caliber indicated through a procedure individualized to each clients personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by a refund provision as stipulated in our agreements. Identity is covered and, if employed, present position protected. If you have actually earned over $2,500, send only name and address for details. R. W. Bixby, Inc., 266 Delward Bldg., Buffalo, N. Y. (A.M.)

POSITIONS WANTED

New York

PERSONNEL DIRECTOR—Seasoned executive: Mechanical engineer familiar all phases metal goods manufacturing; employment safety; vestibule training; welfare; hospitalization; insurance; wage incentives. PW-334, American Machinist, 330 West 42nd Street, New York City.

Pennsylvania

TOOL DESIGNER, age 30, 10 years tool and die experience, desires designing or sales engineering position. PW-328, American Machinist, 330 West 42nd Street, New York City.

PATENT ATTORNEY

PATENTS—Booklet free. Highest references. Best results. Watson E. Coleman, Patent Lawyer, 724 Ninth Street, Washington, D. C.

FOR SALE

THE RIGHTS TO MANUFACTURE AND SELL the finest article ever shown to any Sportsman the—BOW FACEING BOAT OARS—in use in United States and Canada. Circulars and other information on request.

GRAHAM PRODUCTS CO.
1534 High St., Lansing, Mich.

SELLING OPPORTUNITIES OFFERED—WANTED

Selling Agencies—Sales Executives
Salesmen—Additional Lines

OPPORTUNITY OFFERED

SALES REPRESENTATIVE with complete following and capable of doing an outstanding job of selling in the Chicago territory with a line of machine tools which has been universally recognized as the leader in its field for 25 years. Must be thoroughly conversant with gears and their manufacture. SW-333, American Machinist, 520 No. Michigan Ave., Chicago, Ill.

WANTED

WILL PAY CASH for reasonably priced tool room surface grinder. Good condition. Late model not required. Zona Company, Wichita, Kansas.

WANTED

WANTED

Surface Plates—B.&S. or T-P 24x36 up to 42x42 scraped; must be in good condition. Also **ground plain and box parallels, angle irons, height guages** and **other measuring tools.**

W-329, American Machinist,
330 W. 42d St., New York City.

WANTED

1—#41 or 42 **Lucas**; 1—#5B **Swiss Jig Borer**; 1—3½'-4' **Cincinnati or American Radial**; 1—#2 **G-B. & S. Automatic**; 1—#3 or 4A **W. & S. Universal Turret Lathe**; 1—#1 or #11 **B. & S. Grinders**; 2—**Gorton Engraving Machines**; 1—22 or 32 **Van Norman Miller**; 3—2, 3 or 4 **Spindle Drills**; 6—**Single Spindle Bench Drills.** Send full description and particulars with prices. Equipment must be suitable for precision work.

W-327, American Machinist
330 W. 42nd St., New York City

WANTED

Production Man

To superintendents or assistant superintendents of first class plants making heavy machinery and who have proven themselves real producers we offer an unusual opportunity.

Must be A-1 mechanic between 35 and 40 and have thorough knowledge of machine shop operations, plate and sheet metal forming and welding. Foundry and pattern shop experience helpful but not essential.

Do not waste postage answering unless you fill above specifications. To receive consideration, give in first letter, your age, education, training, places employed, lengths of service and salary expected. All replies in absolute confidence.

P-326, American Machinist
330 West 42nd Street, New York City

CONTRACT WORK

See page 71

GEAR EQUIPMENT
USED AND REBUILT

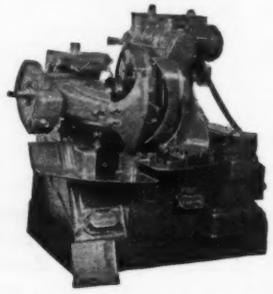
HOBBERS
No. 12 Barber-Colman
(Single overarm, Double overarm, also Splining machines)
16" Cincinnati
No. 1 Adams Farwell
Cleveland 8-spindle Rotary Spline
18H Gould & Eberhardt
No. 1 Lees Bradner
Barber-Colman Model B

GEAR GENERATORS
5A Lees Bradner
5AC Lees Bradner
No. 2 Lees Bradner

MISCELLANEOUS
36ST Gould & Eberhardt Spur Gear Rougher
12" Cincinnati Gear Burnisher
Cross Tooth Rounder
Fellows Thread Generator
Pratt & Whitney Auto. Worm Grinder
Pratt & Whitney 10" Hydraulic Spur & Helical Gear Grinder

SPIRAL BEVEL EQUIPMENT
15" Gleason Spiral Bevel Gear Generators

SPECIAL



31—Gleason 10" Spiral Bevel Gear and Pinion Generators. Complete. Motor drive. Practically new condition. Priced exceptionally low.

2—Cleveland Eight-Spindle Rotary Spline Hobbers for large production on axle shafts or similar work.

15" Gleason Spiral Bevel Gear Roughers
15" Gleason Hypoid Generators
Gleason Spiral Bevel Pinion Gear Roughers
10" Gleason Spiral Bevel Gear Generators
10" Gleason Spiral Bevel Pinion Generators
Gleason Cutter Angle Testing Machine
Gleason Cutter Trueing Device
15" Gleason Spiral Bevel Gear Burnisher

BEVEL GEAR EQUIPMENT
18" Gleason Testing
18" Gleason Tester & Lapper
36BM Gould & Eberhardt Rougher
24"x8" Gould & Eberhardt Rougher
18" Gleason Generator
11" Gleason Generator
8" Gleason Mfg. Generator

THREAD MILLERS
6"x14" Pratt & Whitney
6"x80" Pratt & Whitney
6"x132" Pratt & Whitney
10"x24" Pratt & Whitney Model B
No. 6 Lees Bradner
No. 8 Lees Bradner
Hanson-Whitney
Type D Hall Duplex Planetary

All of these machines are located in our Chicago Stock, ready for prompt delivery

LOUIS E. EMERMAN & CO.
1763 ELSTON AVE. CHICAGO, ILL.

HIGH GRADE MACHINE TOOLS

LATHES
26"x14' Bridgeford Grd. Hd.
21"x10' LeBlond Grd. Hd.
18"x14' Monarch Grd. Hd.
24"x12' L&S 3 SCD
27"x16' L&S Grd. Hd.
36"x24' L&S Selec. Grd. Hd.
42"x18' Bridgeford Grd. Hd.
42"x20' American Grd. Hd. A.C. M.D.

GRINDERS
16"x72" Landis Plain, Self Cont.
#78 Wilmarth & Marmon Surface Grinder
Nos. 50, 55, 60, 65 and 70 Heralds

GEAR CUTTERS
3—26", 4—36" B&S
#6 Fellows
18H Gould & Eberhardt Hobber
6" Gleason

BOLT AND PIPE THREADERS
½" Landis Dbl. Spdl.
2½" Landis Lead Screw 2" Acme S.P.D.

BORING MILLS
24" Bullard 42" Colburn
No. 2 Barrett Horz. No. 1 Rockford Horz.

MILLING MACHINES
No. 2 Hendey Univ.
No. 2½ Rockford Univ.
No. 2 Cleveland SPD
No. 3 Cincinnati Univ. H.P. Cone drive
No. 4 Cincinnati Plain High Power Cone
No. 4 Cincinnati Miller, Universal Cone Drive
No. 2B Milwaukee
No. 3 Kempsmith Universal, Cone
No. 2 Kempsmith Universal

RADIAL AND UPRIGHT DRILLS
2½, 3, 3½, 6' Cinc.-Bick., S.P.D.
3, 3½, 4 and 6' American Triple Purp. Enc. Hd.
20" 3 spdl. Barnes camelback

SHAPERS
16", 20", 24". G.&E., mtr. dr., thru. g.b.

MISCELLANEOUS
13'x¼" Covington Plate Shear
20"x26"x8' Cleveland Openside Planer

Write for Complete Catalog. We Buy, Sell and Exchange

CINCINNATI MACHINERY & SUPPLY CO.
217 East Second St. Cincinnati, Ohio

24"x15' Prentice Grd. Head Lathe
62" Betts Vertical Boring Mill, B.D.
4' Am. Radial Gear Box, S.P.D.
5' Cincinnati-Bickford Radial Drill
42"x42"x12' Cincinnati Planer, 3 Hds.
No. 6 Becker Vertical Miller, M.D.
42" King Boring Mill, 2 hds., M.D.
60"x60"x20' Planer Pond, 4 Hds.

WEST PENN MACHINERY COMPANY
1210 House Bldg., Pittsburgh, Penna.

FORGING MACHINE

1½" Acme All Steel, 8" stroke, for motor drive. Weight 18,000 lbs. Used very little. Fine condition. Attractive price.

PRESSES

95-E Toledo D.C., D.B.G. Tie-Rod, 10" stroke, 85" betw. housings, friction clutch. Spring knockout, for motor drive. In excellent condition.

59½ Toledo S.C., D.B.G., Tie-Rod, bed 40x40", 8" stroke, Fctn Clutch, B.D., Good.

77½ Bliss S.C., D.B.G., Tie-Rod, 8" stroke, with Marquette Cushions.

57 Toledo S.C., D.B.G., 16" stroke, bed 24"x24", Friction Clutch, for belt drive.

MARR-GALBREATH
MACHINERY CO.
55 Water Street, PITTSBURGH, PA.

QUALITY TOOLS

AUTOMATICS. 14" Fay, late type
AUTOMATICS. 454 & 654 New Britain
BROACH. No. 3 Oilgear hydraulic
BULLDOZERS. Nos. 23 & 25 Williams White
COMPRESSOR. 550' National Vertical, M.D.
DIAMOND BORER, 2 spdl. Coulter
DRILLS. Nos. 216, 217, 315, 321 Baker
DRILLS. 21" 24" & 28" Cincinnati
DRILLS, RADIAL. 3½', 4', 5', 6' & 8 Western
GEAR SHAPERS. Nos. 6 & 715 Fellows
GEAR HUBBERS. Nos. 18H & 24H G. & E.
GRINDER, Centerless. No. 2 Cincinnati
GRINDER, Disc. 18", 24" & 30" Gardner
GRINDER, Disc. Nos. 220 & 221 Badger
GRINDER, Internal. Nos. 70, 72, 72A3 Heald
GRINDER, Univ. No. 4 Brown & Sharpe
HAMMER. No. 5I Nazel air
LATHE. 14"x6' American grd. head
LATHE. 16"x8' & 10' Lodge & Sh. grd. head
LATHE. 18"x8' & 20"x8' Walcott
LATHE, TURRET. Nos. 4, 6 & 3A W. & S.
LATHE, TURRET. 24" Bullard vert.
MILL, BORING. 42" King, 1 pl., 1 turret hd.
MILL, BORING. 60" Gisholt
MILLER, PLAIN. Nos. 2, 3 & 4 Cincinnati
MILLER, UNIV. Nos. 2 & 3A Hvy. B.&S.
PLANER. 36"x8' & 36"x12' Gray
PRESS. Nos. 1½B & 5A Bliss toggle
ROLL. 48" McKay 19 roll leveling
SLOTTER. 20" Betts, MD, PRT.

2000 Tools in Stock. Send for List.

MILES MACHINERY CO.
SAGINAW, MICH.

MACHINE TOOLS

1—26"—19' bed **American Lathe**
1—18"—8' bed **Morris Lathe**
1—**Double End Pedestal Grinder**
1—#1 **Niles Pipe Machine**
1—#90 **Fairbanks Power Hack Saw**
1—20' bed 13' **Platten Am. Tool Planer**
1—**Boring Mill, Barret** Horiz. double spdl. 4" and 3" Boring Bars 52x80" table
1—#3 **Barrett Horizontal Boring Mill** 3½x84" table

LARGE STOCK WESTG. SK
VAR. SPEED MOTORS

Duquesne Electric & Mfg. Company
PITTSBURGH, PA.

TURRET LATHES

#1 B.&S. ⅝" cap. lot of tools, collets, etc., serial 1200.
#3A W. & S. motor dr. arranged & equipped for chucking, serial 250600.

THE O'BRIEN MACHINERY CO.
113 N. THIRD ST., PHILADELPHIA, PA.

POWER PRESSES

BLISS, TOLEDO, V & O, ETC.
REBUILT — GUARANTEED

JOSEPH HYMAN & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

LUCAS LIST

30 YEARS OF DEPENDABLE WORKMANSHIP

SPECIALS

6' American Triple Purpose Radial Drill
#40 Bodine 3-spindle Driller M.D.
#14 Natco Multiple Spindle Drill
#5—60" Gould & Eberhardt Gear Cutter
#4—48" Brown & Sharpe Auto. Gear Cutter
2—10"x18" Norton Plain Cylindrical Grinders M.D.
#70 Heald Duplex Internal Grinder
#2-I Brown & Sharpe Universal Grinder M.D.
#16 and #16A Blanchard Vert. Surface Grinders
3—#1 Waterbury Farrel D.S.S.D. Headers M.D.
5—#0 Waterbury Farrel D.S.S.D. Headers M.D.
#4 Cincinnati Rectangular Overarm Plain Miller S.P.D.

Send for the latest Lucas List

J. L. LUCAS & SON, Inc.
3 Fox St., Bridgeport, Conn.

BIG PRESSES

#168¾ Toledo Toggle Drawing & Deep Stamping Press, double geared; 56½x50" bolster plate; 26" stroke. Weight approx. 124,000#.

#268¼ Toledo Double Crank Toggle Drawing & Deep Stamping Press; 84¾" between uprights; 58x77" blankholder; 29" stroke of plunger with 8" adjustment; weight approx. 175,000#.

Both machines in excellent condition and available for immediate shipment.

The EASTERN MACHINERY CO.
1004 Tennessee Ave., Cincinnati, Ohio

HILL-CLARKE

OFFERS

Automatics
No. 2G Brown & Sharpe
2¼", 3¼", 4¼" Gridley Single Spdl.
4¼" Cleveland "Model A"

Boring Machines, 5" Bar N-B-P Floor Type
5" Bar Newton Portable
No. 3 Hamilton, 4½" bar
No. 3B Rochester, 3½" bar
No. 3A Universal, 3" bar
No. 1 Cleveland, 2½" bar

Boring Mills, 24", 36", 42" Bullard "New Era"
24" Bullard "Rapid Production"
30" King
42", 48" & 54" Colburn
52" & 62" King
60" Colburn

Drills—1, 2, 3, 4, 6 spdl. Leland-Gifford
1, 2, 3, 4, 6 spdl. Henry & Wright
32" Cinn.-Bickford Slid. Head
No. 2 Colburn 1, 2, 3 & 4 spdl.
No. 3—24" Defiance
Nos. 121, 314 Baker
No. 210—1 and 3 spdl. Barnes
No. 25—36" Foote-Burt
No. 14 Natco Multiple
No. 4 Bausch Multiple

Radials—
4' Foodick Sensitive
5' American Triple Purpose
5' American Full Univ. M.D.
6' American Triple Purpose

Gear Cutters, No. 18-H Gould & Eberhardt
No. 16—HS Gould & Eberhardt
No. 3—26" Brown & Sharpe
No. 4—48" Brown & Sharpe
No. 6—60" Brown & Sharpe
No. 2—60" Goss Hobber
No. 6—72" Brown & Sharpe
96" Newton Heavy Duty
Nos. 6, 61, 62, 65, 615, 625 Fellows
12"x72" G.&E. Rack Cutter

Grinders, 10"x36", 52" Landis, plain
20"x168" Landis, plain, M.D.
26"x96" Landis, plain
No. 2 B. & S. Universal
No. 4—12"x66" Landis Universal
No. 70 Heald, Internal
No. 10 Blanchard Surface
No. 16-A Blanchard Auto. Surface
15"x17"x6', 8' Norton O.S. surf., mag. chuck
No. 1 Gardner face. Hyd. Fd.
16"x48" Landis Crankpin

Motor Drive Norton Grinders

6"x32"	14"x36"
10"x18"	14"x50"
10"x24"	14"x72"
10"x36"	14"x96"
10"x50"	16"x50"
10"x72"	18"x96"
10"x96"	18"x144"

Lathes—
14"x6' Lodge & Shipley
14"x8' American
16"x6' American
16"x8' Lodge & Shipley, taper attach.
20"x8' Lodge & Shipley
20"x14' L. & S. sel. grd. hd.
22"x12' Lodge & Shipley
24"x12' L. & S. Sel. Grd. Hd.
30"x11', American Grd. Hd.
36"x30' Rahn-Larmon, grd. hd.
54"x23' Johnson, T.G.
66"x21' Putnam, triple geared

Millers, No. 2-B Brown & Sharpe, plain
No. 2, No. 3 Cincinnati, high power, plain
No. 2-B Milwaukee Pl., Motor-in-Base
No. 2-B, No. 3-B Milwaukee, Plain
No. 3-B, No. 4-B Heavy Brown & Sharpe, pl.
No. 4 Cincinnati, plain
Nos. 1½, 2 B. & S. Universal
No. 2, No. 3, Cincinnati H.P. Vertical
No. 3-B, Milwaukee Vertical
No. 5-B, No. 6 Becker Vertical
6"x48" Pratt & Whitney Thread
No. 3-E & No. 4 Lees-Bradner Thread
18" & 24" Cincinnati Auto. Duplex
No. 5—48" Cincinnati Pl. Hydromatic
24"x24"x12' Ingersoll Adj. Rail
36"x36"x12' Newton Duplex Miller
38"x44"x20' Ingersoll Slab Miller

Planers, 24"x24"x6' American
26" Lynd-Farquhar OS., planer, shaper
30"x30"x6' & 18' Cincinnati
36"x36"x8', 12', 18' Cincinnati
36"x36"x14'—24' Cleveland Open Side
36"x36"x24' Gray
42"x42"x30' Niles Bement Pond, rev. m.d.
44"x36"x12' Gray
48"x48"x10' Det. & Harv., O.S.
60"x48 x16' Gray, arr. rev. M.D.
60"x48"x20' Hamilton
72"x60"x16' American

Shapers, 16" Walcott
16" Stockbridge
24" Gould & Eberhardt

Turret Lathes, No. 4 Warner & Swasey Univ.
No. 1-A Warner & Swasey
No. 2-A Warner & Swasey
No. 3-A Warner & Swasey, Timken Brgs.
No. 3 Cinn.-Acme, A.C. & B.F.
No. 4-A W. & S. 7⅝" H.S.
No. 4-L Gisholt 9¼" H.S.

HILL-CLARKE MACHINERY CO
651 Washington Blvd. - Chicago

DRILLING MACHINES

Multiple and Radial

1—14" Bausch rd. hd. 8 spdles.
2—C12 Natcos 12x18" hd. 6 spdles.
1—#12 Natco 8 spindles with tap. attach.
1—#13 Natco rect. hd. with adj. table.
1—#14 Natco rect. hd. with 10 spdles.
1—#30 Natco rect. hd. 23 spdles.
1—#60 Natco 3 way mtiple. m.d.
1—American 5'13" col. triple grd. m.d.
5—3' Carlton Sensitive radials with tap. attach.
4—4' Hammond Sens. Radials with tap. attach.
1—4' Mueller plain radl. gr. hx. dr.
1—5' American 14" col. encl. hd. gr. hx. dr.
2—6' American 16" col. mt. on arm pl. rad.
1—6' Cincinnati Bickford 15" diam. col. gr. hx.

We Carry a Full Stock of Used Machine Tools

Your Inquiries will be appreciated

THE STRONG, CARLISLE & HAMMOND CO.
1392 West Third St., Cleveland, Ohio
2832 East Grand Blvd., Detroit, Michigan

Ingersoll Rand 2 Stage Air Compressor—Type XRB—7x10 and 11x10—Complete with motor
No. 4 & 6 Warner Swasey Hand Screw Machine
30"x12' American, 16"x8' Lodge & Shipley Engine Lathes, Cone Drive with Taper attachment
16", 20", 24" 28" Gould & Eberhardt Shapers, single pulley drive and cone drive
No. 70 & 75 Heald Internal Grinders
Avey Ball Bearing Drills, 1, 2, 3 spindles
No. 2, 3 Cincinnati Millers—Plain & Universal Cone Drive
No. 2 Diamond Surface Grinder

Partial List—Send Us Your Inquiries

Indianapolis Machinery & Supply Co., Inc.
1959-69 South Meridian St., Indianapolis, Ind.

No. 3B D.A. Milwaukee Universal Miller—Vert. attach—S.P.D.
No. Le Blond Plain Miller S.P.D.
4½ Morris Radial S.P.D. gear box
12x72 Landis Plain Grinder
24"x12' Greaves-Klusman Lathe, cone drive
14"x6' Hendey Lathe, cone drive
24" Gould & Eberhardt Shaper, cone drive
16" American Shaper, cone drive
20" Stockbridge Shaper, cone drive
No. 3 Mitts & Merrill Keyseater
30 Ton Lucas Power Forcing Press
6' and 10' Robinson Press Brake
16" Landis Crankshaft Grinder
Leland-Gifford 3 spindle drill with tapping heads

IROQUOIS MACHINERY CO.
662 Ohio St., Buffalo, N. Y.

BARGAINS

Pond Planer 84" under rail 8' 5" between housings. 25' table 4 heads. Belted motor drive. Condition very fine.

Worthington 1050 cu.ft. Air Compressor. Motor on main shaft 186 H.P. syn. 440-3-60. Complete with starting panels and receiver. New in 1921.

Ingersoll Rand 1300 Air Compressor. Motor on main shaft 225 HP syn. 440-3-60. Complete with starting panels and receiver. New 1932.

#10-62" **Bliss** S.S. Tie Rod Press 10" dia. shaft 8" stroke. Double geared twin drive friction clutch.

Send for our current list of bargains

BEATTY MACHINE & MFG. CO.
948 150th St. HAMMOND, Indiana

VERTICAL BORING MILLS

60" Cincinnati—2 swivel heads—Rapid Traverse to heads—Constant speed drive.
42" Bullard—2 swivel heads—Rapid Traverse to heads—Single pulley drive thru self-contained countershaft.
48" Colburn—2 swivel heads—Single pulley drive.

GRINDERS

No. 16 Blanchard—Direct Motor Drive—20" magnetic chuck.
No. 3 Bryant Internal—Motor Drive.

MILLERS

No. 5 Cincinnati Plain—Power Rapid Traverse Motor Drive.
No. 4 Cincinnati Vertical—Single Pulley Drive
No. 3-B Milwaukee Vertical—Power Rapid Traverse—Motor Drive.
No. 2½-B Milwaukee Vertical—Single Pulley Dr.

LATHE

42"x21' American 16 Speed Geared Head—Motor Drive.

Sun Machinery Company, Inc.
36 Van Vechten St., Newark, N. J.

Backed by *MOREY'S* Reputation

BORING MILLS
Horizontal and Vertical

NILES BEMENT POND No. 1½ Port. 3⅞" bar
BEAMAN & SMITH 5" bar—horiz.
BULLARD 24" N.E. and 42" N.E. Vert.
COLBURN 54"; 2 swivel heads
NILES BEMENT POND 7-10" Extension
NILES BEMENT POND 42"—44"—51"—53"
NILES 10' vertical
POND 90"; 2 hds. vertical

PLANERS
AMERICAN 36"x36"x20'; 3 hds.
CINCINNATI 36"x36"x12'; 2 hds.
NBP 48"x48"x16'; 4 hds.
CLEVELAND 48"x48"x16', 4 hds open side

LATHES
NILES BEMENT POND 46"x15' Q.C.G.
PITTSBURGH 36"x38', grd. hd.
PUTNAM 36"x28', 3 step cone, DBG.
PUTNAM 36"x28' Grd. Head—Nearly New
BRIDGEFORD 36"x60', comb. boring and turning
BRIDGEFORD 36"x60', boring
McCABE 27-49x16' Double Spindle
LODGE & SHIPLEY 24"x10' cone dr.
GREAVES KLUSMAN 16"x8' motor-in-base
MONARCH 14"x10' geared head

MILLING MACHINES
CINCINNATI 24", 48" Automatic
INGERSOLL No. 3 Combined heavy duty Vert.
INGERSOLL 24"x24"x12", planer type
INGERSOLL 24"x24"x12', slab
NEWTON No. 2 Ver. spdl. keyseat
BROWN & SHARPE No. 4 Universal cone dr.
CINCINNATI Nos. 2, 3, 4 Plain
LEES BRADNER No. 4 thread
PRATT & WHITNEY 4½x12, 6x48, 6x80 thread
BECKER C-1 and C Vertical
BROWN & SHARPE No. 1 Vert.

BULLARD 42" New Era Type
Vertical Turret Lathe—side head—cutting lubricant system

DRILL PRESSES
NATCO No. 12, No. 13, No. 22 Multiple spdle.
NATCO C11 Drill—mechanical feeds
NATCO C13H Drill—hydraulic feeds
PRATT & WHITNEY No. 12 rect. head

DRILLS—RADIAL
AMERICAN 3', 5' triple purpose
CINCINNATI BICKFORD 5' full Univ.
DRESES 3' and 5' Pl. SPD.
REED PRENTICE 4' Pl.

GEAR CUTTING EQUIPMENT
BARBER & COLMAN Nos. 3 and 12 Gear Hobbers
CLEVELAND 8 spdle. Spline Hobber
GLEASON 15" Spiral Bevel Gear Finisher
GLEASON 10" Spiral Bevel Gear
FELLOWS Nos. 6, 61, 615
FELLOWS Nos. 7, 71
FELLOWS No. 8B Burnisher
LEES BRADNER Lapper cap. 1¼"x8"

GRINDERS
BRYANT No. 3 Internal
HEALD Nos. 50, 55, 60, 65 Intl.
LANDIS 10x24, 10x36, 10x72
LANDIS 20x132 cylindrical
NORTON 14x72, Plain Cyl.
NORTON type B8I 14x30-36" crankpin
DIAMOND 48" type H Surf.
PERSONS ARTER 12" Rotary Surf.
DIAMOND 84" Face
PRATT & WHITNEY No. 14 surface
HEALD No. 72 Hydr.; 72-A-3 Sizematic

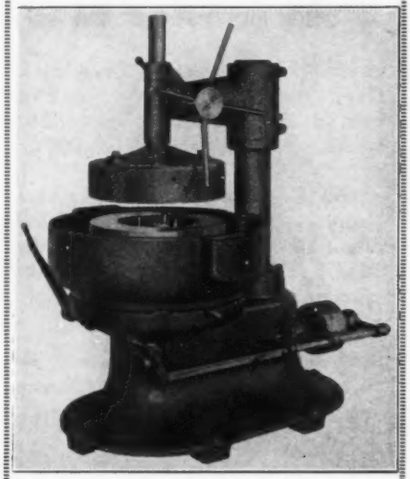
MISCELLANEOUS
ACME 2" all steel upsetter
FOSTER No. 1B and No. 3B Univ. Turret Lathe
CLEVELAND ⅜"; 2-2½"; 2¼x2¾" Model "A"
TREADWELL 12" pipe mach.
LIBBY 18" Model "A", 26"—7½" hole
PRATT & WHITNEY No. 12 Profiler, grd.
GLEASON 12" Cutter Sharpener
REED PRENTICE No. 3 Vert. die sinker, late type
LYND FARAQUHAR 26" Shaper; spls. hd.
HENRY & WRIGHT 50 ton Die Machine

ask for details

1000 other machines in stock—

MOREY
MACHINERY CO., INC
410 BROOME ST. NEW YORK

LAPPING MACHINES



15—1F NORTON, 20" dia. lap
Late type, motor drive

2—1F BETHEL PLAYER, 20" dia. lap

7—1C BETHEL PLAYER, 20" dia. lap

2—#23 BETHEL PLAYER, 27" dia. lap

1—No. U BETHEL PLAYER, 14" dia. lap

All above ready for immediate shipment

LOUIS E. EMERMAN & CO.
1761 Elston Ave. Chicago

GOOD TOOLS

Drill, No. 4 Colburn, four spindle, Manufacturing type, capacity 2" in solid steel. GOOD AS NEW.

Drill, Radial, 5' American Triple Geared, tapping attachment, M.D.

Miller & Driller, #1½ Knight, M.D.

Miller, planer type, 20"x10' Newton, adjustable rail

Shaper, 25" Smith & Mills, B.G., cone

Shaper, 24" Cincinnati, B.G., cone

Turret Lathe No. 6 W. & S., grd. head, 12 speed

Large stock, send us your inquiries

Reliance Machinery Sales Company
1412 Brighton Place, N.S., Pittsburgh, Pa.

MACHINE TOOLS
BOILERS, MOTORS
POWER EQUIPMENT

DELTA EQUIPMENT CO.
148 N. 3rd St.,
Philadelphia, Pa.

DETROIT BARGAINS

TURRET LATHE—#4 W&S, 6 speed, G.H., Univ.
TURRET LATHE—#6 W&S, Cone Drive.
TURRET LATHE—#2-A Cinc. Acme, G.H., M.D.
TURRET LATHE—45" Bul. Ver., 2 sw. hds., B.D.
PROFILER—#12 Two Spindle P&W, Arr. M.D.
SHAPER—16" Gould & Eberhardt M.D.
SURFACER—#2 Brown & Sharpe, B.D.
GRINDER—#2 Cincinnati Cutter, B.D.
GRINDER—#14 Brown & Sharpe External, B.D.
GRINDER—Lees-Bradner Gear Tooth Grinder.
GRINDER—Norton Type A, 10"x24" Special Cam Grinder, M.D.
Complete setup of 15" Gleason Spiral Bevel Gear Cutting Equipment, consisting of 1—15" Rougher; 2—15" Finishers; 1—Lapper; 1—Tester; 1—Cutter Grinder. Price exceptionally low for quick sale.

JAMES W GEORGE HIGH GRADE MACHINE TOOLS DETROIT, MICH.

James W. George
313 E. Jefferson Ave.
Detroit, Michigan

HEAVY DUTY PLATE DRILL

80 Spindle Hill Drill No. 1-F equipped with 80 No. 3 M. T. heads and 25 No. 5 M. T. heads adjustable for center distance on the rail; 26' between housings; motor driven. Write for full specifications and photograph.

Many Other High Grade Machines

INDUSTRIAL MACHINERY COMPANY
2100-2300 Fletcher Ave. Indianapolis, Ind.
Drexel 3300.

OTT MACHINERY SPECIALS

Cincinnati 48"x36"x8' Planer, 2 Rail Hds.
Lucas #21 Horizontal Bor. Mill, 2¾" Bar
Niles, Bement, Pond 36"x10' G.H. Lathe
Rochester 3½" bar Floor type Horizontal Boring Drilling & Milling Machine
Western 5' Plain Radial Drill, M.D.

OTT MACHINERY SALES, INC.
542 Second Ave. Detroit, Michigan

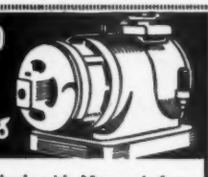
UNUSUAL VALUES

1—#1 **Kempsmith Universal Miller**
1—#25 **Bilton Plain Miller** (new)
1—#1½ **Valley City Plain Miller**
1—#2 **Heavy H & S Miller**
1—#4 **LeBlond Plain Miller**
1—24"x20x8 **Ingersoll Miller**
1—16" **Back Geared Queen City Shaper**
1—20" **Smith & Mills Shaper**
1—24" **Gould & Eberhard Shaper**
1—**Clark Compound Metal Band Sawing Machine**
1—#4 **Lees Bradner Thread Miller**
1—#24 **Toledo Double Acting Cam Drawing Press**

MOTORS—New 5 HP 3 phase, ball brg. $61.75, *other sizes equally low prices. Also rebuilt motors.*

The Osborne & Sexton Machinery Co.
COLUMBUS, OHIO

MOTORIZED *Speed Reducers*



Save up to 75%. Check with Moreco before buying. Hundreds of reducers in stock — immediate shipment. Completely overhauled and guaranteed like new. Speed reducer specialists. We buy, sell, exchange. Specify horsepower, speed ratios and application. Write

THE MOTOR REPAIR AND MANUFACTURING CO.
1548 HAMILTON AVE. • CLEVELAND, OHIO

GOOD USED POWER EQUIPMENT

Immediate Delivery—Substantial Savings
Boilers, Engines, Turbines, Generators, Motors, Compressors, Pumps, Transformers, Condensers, Converters, Fans, Speed Reducers, etc., etc.
Write for free copy of nationally advertised lists of equipment now available.

Departmental Advertising Staff
McGraw Hill Pub. Co.,330 W.42d St.,New York,N.Y.

SOME OF OUR LARGE MACHINES FROM STOCK

100" x 50' Niles B. P. Heavy duty lathe
96" x 54' Niles B. P. Lathe
90" Niles B. P. wheel lathe
84" x 29' Niles B. P. extra heavy duty lathe
42" x 22" Niles B. P. extra heavy duty geared head
48" Niles B. P. Wheel lathe
36" x26' Lodge & Shipley geared head
30" x 16' Houston Stanwood and Gamble heavy duty lathe
#30-M Giddings and Lewis horizontal Milling Machine
#5-C, #2A, Model SD and C8 Becker vertical millers
#2 Cincinnati Hi-Power vertical miller
#3-B Milwaukee Hi Power Plain Miller, S. P. D.
#5 Cincinnati Hi-Power Plain miller
#4B Brown & Sharpe heavy duty miller
Various Ingersoll planer type millers
16' Niles Vertical Boring Mill
10-16' Betts heavy duty vertical boring mill
10' Betts vertical boring mill
96" Niles Vertical Boring Mill
90" Pond vertical boring mill
60" Niles vertical heavy duty boring mill
60" Colburn vertical boring mill
36"-44" Niles vertical lathe
36" Bullard New Era Vertical Mill with Side Head

#45 Giddings & Lewis horizontal boring mill
7" Bar D & H Floor-Type Horizontal Mill
6" Bar Espen-Lewis horizontal boring mill
#1, 2 and 6 Barrett horizontals
84" x 84" x 20' Niles B. P. Planer
84" x 60" x 14' Niles B. P. Planer
72" x 72" x 12' Niles B. P. Heavy Duty Planer
56" x 56" x 12' Niles B. P. Heavy Duty Planer
50" x 48" x 10' Cincinnati Heavy Duty Planer
48" x 42" x 20' Detrick and Harvey Open Side Planer
72" Bement Rotary Planer
100" Gould and Eberhardt horizontal Hobber
30" x 144" Landis Plain Cylindrical Grinder M.D.
1—18" x 84" Landis plain cyl. grinder
1—14" x 72" Horton plain cyl. grinder
#2, #3, #4 Brown & Sharpe Universal Grinder
#13 Brown and Sharpe Universal Grinder
5'—6' Cincinnati Bickford Plain radial M. D. drill
1—5' Niles Right line plain radial drill
1—5' American triple purpose plain drill
1—40' x 1" Southwark bending rolls
10 x 3/4" Ohls Brake
#3-1/2 Baker Keyseater
13' x 1/2 Niles Bement Pond Bending Roll

SIMMONS MACHINE TOOL CORPORATION

ALBANY, NEW YORK — *WRITE FOR LATEST STOCK LIST* — NEW YORK CITY—149 BROADWAY

IMMEDIATE SHIPMENT

Air Compressor, No. 18 North American, 16 Oz. 2400 C.F.M.
Cut Off Machine, No 5½ Nutter Barnes
Drill, Bausch Multiple, 8 Spdle, #2 Taper
Gear Hobber, No. 12 Barber Coleman
Grinder, No. 2 Cincinnati, Cylindrical
Leveling Roll, 11 Roll Yoder
Mill, No. 4 Cincinnati, Plain, Cone Drive
Mill, No. 45 Bilton Producto-Matic
Mill, Gooley & Edlund Type A, Production
Mill, Vertical, No. 6 Becker
Mill, Vertical Model SD Becker
Mill, Vertical, Model C Becker, Twin Hds.
Nibblers, No. 1 & No. 2 Campbell
Punch & Shear, No. 5 Ironton
Power Folder, 42" Jarecki
Swaging Machine, No. 3½ Torrington
Sand Blast Outfit, 36x46" New Haven Rotary
Welder, Federal Projection, 100 K.V.A.

SURPLUS MATERIAL & MACHINERY CO.
8735 Kercheval Ave. Detroit, Mich.

SPECIALS

82"x1" Cap. **L. & A. Gate Shear.**
No. 13 **B&S Univ. Tool Grinder.**
No. 2 **B&S Surface Grinder.**
No. 2 & 3 **W. & M. Surface Grinder.**
No. 3 **DIAMOND Surface Grinder.**
No. 2 **CINTI: Univ. Miller** BD
No. 2A **B&S Univ. Miller** SPD
No. 2B **B&S Plain Miller** SPD.
No. 1½ **ROCKFORD Pl. Miller** BD.
14x6' **HENDY Lathe Tic Bar.**
15" **P&J tool room shaper.**
3' **BICKFORD Radial drill** SPD.
42" **GISHOLT Vert. Boring Mill.**

SEND FOR OUR NEW STOCK LIST

THE JONES MACHINE TOOL COMPANY
531 E. Front St., Cincinnati, Ohio

MACHINE TOOLS

1—14-7B **Special Z&H** 50 Ton **Precussion Press.**
1—**Gisholt Precision Dynamic Balancer.**
3—#14 B & S **Cylindrical Grinders** B.D.
1—6 Spdle. **Holmes Tapper** arranged m.d.
4—8" **Sundstrand Stub Lathes** D. with motor.
1—10' #5 **Hilles & Jones Straightening Rolls.**
1—48x48x14' **Hamilton Planer** including motor, 4 heads box table.
1—Baker No. 50H **Hydraulic "Twin Pull" Vertical Boring and Drilling Machine** complete with 2 motors.

Your inquiries receive prompt attention

CENTRAL MACHINE TOOL CORPORATION
19-23 Lucas Street Toledo, Ohio
Adams 1914

CONTRACT WORK

Special Machinery, Dies, Tools, Jigs, etc. on Contract

LINCOLN Contract Service

All made exactly to your specifications, at lower cost than you'd expect, and delivered on time. A modern, fully equipped plant at your service. Quotations cheerfully given—send blueprints or samples.

Lincoln Machine Co., Pawtucket, R. I.

COMMERCIAL HEAT TREATING

Carburizing, Hardening, Tempering and Coloring in quantity

AMERICAN METAL TREATMENT CO.
Elizabeth, N. J.

We'll save you money on Swaged or Hammered Parts

With the most modern swaging and hammering equipment in our shop, we can save you time and money on all kinds of swaged and hammered parts.

Let us estimate on your requirements—We can handle stainless steel, brass, aluminum, all kinds of alloys, etc. to your specifications and order—to limits as close as .0005—to diameters from .006 in. to 3 inches.

Let us estimate also on your Screw Machine Work, Metal Stamping, and Pin and Needle Grinding, exactly to your specifications.

Send us samples or blueprints. You'll be interested in the quality of work we can do and the LOW PRICE.

PHONOGRAPH NEEDLE MFG. COMPANY, Inc.
42-46 Dudley St. Providence, R. I.

ADVERTISING RATES

CONTRACT WORK

DISPLAYED—RATE PER INCH:

1 inch.....$6.25
2 to 3 inches..... 6.00 an inch
4 to 7 inches..... 5.75 an inch
8 to 14 inches..... 5.50 an inch

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page. *Contract rates on request.*

"No, sir! I won't change a single word!"

HE suddenly launched a bitter attack on his competitors.

He hinted at unfair practices...implied that all his rivals were selling inferior goods. And he blared forth these insinuations in full-page newspaper ads.

The National Better Business Bureau pointed out that the type of advertising he was doing was harmful to the entire industry...tried to persuade him to change his copy.

"No, sir!" he shouted angrily, "I won't change a single word of it!"

"Mind your own business!"

He said he'd thank us to mind our own business. He knew what he was doing...and hadn't his products been a big success?

"Of course they have," we admitted, "and will you please take a slip of paper and write down the reasons why your products have been so successful?"

Grudgingly he wrote: "*Quality—Purity—Price—Service.*"

"That's funny," we said, "you don't say a thing about attacks on competition! Yet your last full-page newspaper ad used a quarter of its space to talk about how bad your competitors are. Maybe you are spending 25% of your advertising money to stress a point that doesn't matter!" He promised to think it over.

Apparently he did think it over... for the attacks stopped almost at once. And he hasn't printed a single word of knocking copy since.

• • •

Corrections of misleading or unethical advertising are made by the National Better Business Bureau at the average rate of more than one a day.

Yet this is just one of the many services of the Bureau that are available to any legitimate business. Working tactfully, diplomatically and in strictest confidence, the Bureau will gladly help you solve such problems, whether you are a member of the bureau or not.

The National Better Business Bureau is a non-profit corporation, supported solely by the voluntary contributions of more than 600 business firms. Mail the coupon for the free booklet, "How to Use the National Better Business Bureau."

National Better Business Bureau, Inc.
405 Lexington Avenue, New York City.

Please send me a copy of "How to Use the National Better Business Bureau."

*Name*_____

*Firm Name*_____

*Address*_____

*City*_____ *State*_____

WHERE-TO-BUY DIRECTORY

A Classified Index of Advertisers in this Issue

ABRASIVE Discs
Norton Co., Worcester, Mass.

ABRASIVE Materials & Grits
Norton Co., Worcester, Mass.

ABRASIVE Paper and Cloth
Norton Co., Worcester, Mass.

ACETYLENE, Dissolved
Linde Air Products Co., The, N. Y. C.
Union Carbide & Carbon Corp., N. Y. C.

ACETYLENE GAS
Air Reduction Sales Co., N. Y. C.

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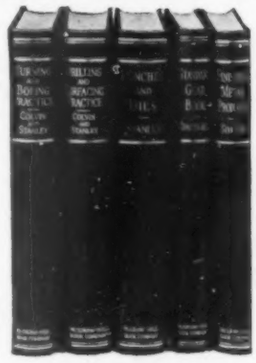

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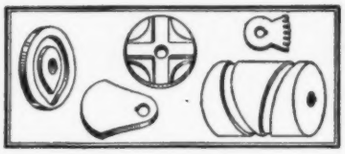

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Air Reduction Sales Co., N. Y. C.
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Meehanite Institute of America, Pittsburgh

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Springfield Mach. Tool Co., Springfield, O.

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Barrett Co., Leon J. Worcester, Mass.

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Gisholt Machine Co., Madison, Wis.
Firth-Sterling Steel Co., McKeesport, Pa.
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Gisholt Machine Co., Madison, Wis.
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Brown & Sharpe Mfg. Co., Providence, R. I.

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Union Twist Drill Co., Athol, Mass.

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Gisholt Machine Co., Madison, Wis.
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Davis Keyseater Co., Rochester, N. Y.
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Armstrong Bros. Tool Co., Chicago
Ridge Tool Co., Elyria, O.

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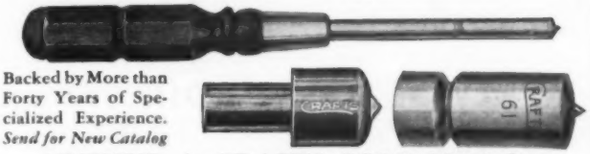

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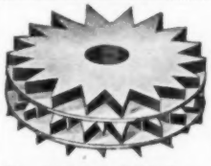

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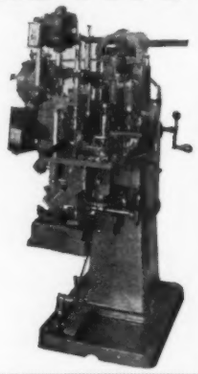

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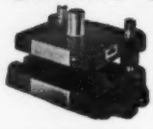

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DRILLING and Tapping Machines, Multiple
Errington Mech. Lab., Staten Island, N. Y.

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Barnes Drill Co, Rockford
Baush Mach. Tool Co., Springfield, Mass.
Cincinnati Bickford Tool Co., Cincinnati
Kingsbury Mach. Tool Corp., Keene, N. H.
National Automatic Tool Co., Richmond, Ill.

DRILLING Machines, Bench
Buffalo Forge Co., Buffalo, N. Y.

DRILLING Machine, Deep Hole
Pratt & Whitney Div., Niles-Bennett-Pond Co., Hartford, Conn.

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Barnes Drill Co., Rockford
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Bickford Tool Co., Cincinnati
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DRILLING Machines, Heavy Duty
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Barnes Drill Co., Rockford
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Bickford Tool Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Foote-Burt Co., Cleveland
Modern Tool Wks., Rochester, N. Y.

DRILLING Machines, Horizontal
Baker Bros., Inc., Toledo
Kingsbury Mach. Tool Corp., Keene, N. H.

DRILLING Machines, Multiple Spindle
Baker Bros., Inc., Toledo
Baush Mach. Tool Co., Springfield, Mass.
Buffalo Forge Co., Buffalo, N. Y.

DRILLING Machines, Radial
American Tool Wks., Co., Cincinnati
Carlton Mach. Tool Co., Cincinnati
Cincinnati Bickford Tool Co., Cincinnati
Dreses Machine Tool Co., Cincinnati
Fosdick Mach. Tool Co., Cincinnati, Ohio

DRILLING Machines, Sensitive
Buffalo Forge Co., Buffalo, N. Y.
Fosdick Mach. Tool Co., Cincinnati, Ohio
Kingsbury Mach. Tool Corp., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.

DRILLING Machines, Turret
Kingsbury Mach. Tool Corp., Keene, N. H.
National Automatic Tool Co., Richmond, Ind.

DRILLING Machines, Upright Multiple Spindle
Baker Bros., Inc., Toledo
Barnes Drill Co., Rockford
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Bickford Tool Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Foote-Burt Co., Cleveland
Fosdick Mach. Tool Co., Cincinnati, Ohio
Grant Mfg. & Mach. Co., Bridgeport, Conn.
Kingsbury Mach. Tool Corp., Keene, N. H.
Modern Tool Wks., Rochester, N. Y.
National Automatic Tool Co., Richmond, Ind.
Pratt & Whitney Co., Niles-Bement-Pond, Hartford, Conn.

DRILLING Machines, Vertical
Baker Bros., Inc., Toledo
Barnes Drill Co., Rockford
Foote-Burt Co., Cleveland
Leland-Gifford Co., Worcester, Mass.

DRILLS
Firth-Sterling Steel Co., McKeesport, Pa.

DRILLS, Brick, Stone, Cement, etc.
Armstrong Bros. Tool Company, Chicago

DRILLS, Center
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.

DRILLS, Portable Electric
Black and Decker Mfg. Co., Towson, Md.

DRILLS, Ratchet
Armstrong Bros. Tool Co., Chicago
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Union Twist Drill Co., Athol, Mass.

DRILLS, Twist and Flat
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.

ELECTRICAL Instruments
General Electric Co., Schenectady, N. Y.

ELECTRICAL Supplies
General Electric Co., Schenectady, N. Y.

END MILLS
Brown & Sharpe Mfg. Co., Providence, R. I.
Gammons-Holman Co., Manchester, Conn.
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.

ENGRAVING MACHINERY
Gorton Mach. Co., Geo., Racine, Wis.

FACE Plates
Brown & Sharpe Mfg. Co., Providence

FANS, Electric
General Electric Co., Schenectady, N. Y.

WHERE-TO-BUY DIRECTORY

A Classified Index of Advertisers in this Issue

FANS, Exhaust
Buffalo Forge Co., Buffalo, N. Y.

FILES and Rasps
Nicholson File Co., Providence

FILING Machines
Cochrane Bly Co., Rochester N. Y.
Oliver Instrument Co., Adrian, Mich.

FITTINGS, Hydraulic
Vickers, Inc., Detroit, Mich.

FLEXIBLE Shaft Equipment
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.

FORGES
Buffalo Forge Co., Buffalo, N. Y.

FORGING Machinery
Acme Mach. Co., Cleveland

FORGINGS Aluminum
Aluminum Co. of America, Pittsburgh

FORGINGS, Copper & Bronze
Revere Copper & Brass Inc., N. Y. C.
Williams & Co., J. H., Buffalo, N. Y.

FORGINGS, Hollow Bored
American Hollow Boring Co., Erie Pa.

FRICTION Pulleys
Brown & Sharpe Mfg. Co., Providence, R. I.

FURNACES, BRAZING
Firth-Sterling Steel Co., McKeesport, Pa.

FURNACES, Gas
Hones, Inc., Chas. A., Baldwin, L. I.

FURNACES, Forging
Ingersoll Rand Co., Phillipsburgh, N. J.

FURNACES, Heat-Treating, Tempering and Annealing
American Gas Furnace Co., Elizabeth, N. J.
General Electric Co., Schenectady, N. Y.
Hones Inc., Chas. A., Baldwin, N. Y.

FURNACES, Melting
Hones, Inc., Chas. A., Baldwin, L. I.

FURNACES, Soldering
Hones Inc., Chas. A., Baldwin, N. Y.

GAGE BLOCKS
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.

GAGES
Brown & Sharpe Mfg. Co., Providence, R. I.

GAGES, Comparator
Jones & Lamson Mach. Co., Springfield, Vt.
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Geo., N. Y. C.

GAGES, Depth
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saganaw, Mich.

GAGES, Dial
Brown & Sharpe Mfg. Co., Providence, R. I.
Randall & Stickney, Waltham, Mass.

GAGES, Electrical
Pratt & Whitney Div., Niles-Bement-Pond, Hartford, Conn.

GAGES, Gear
Boston Gear Works, Inc., North Quincy, Mass.

GAGES, Plug and Ring
Brown & Sharpe Mfg. Co., Providence
Hanson-Whitney Mach. Co., Hartford, Conn.
Pratt & Whitney Co., Div., Niles-Bement-Pond, Hartford, Conn.
Williams & Co., J. H., Buffalo, N. Y

GAGES, Snap and Cylindrical
Brown & Sharpe Mfg. Co., Providence
Hanson-Whitney Mach. Co., Hartford, Conn.
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.

GAGES, Standard
Hanson-Whitney Mach. Co., Hartford, Conn.

GAGES, Surface
Brown & Sharpe Mfg. Co., Providence, R. I.

GAGES, Taper
Brown & Sharpe Mfg. Co., Providence, R. I.

GAGES, Thickness
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.

GAGES, Thread
Brown & Sharpe Mfg. Co., Providence
Lufkin Rule Co., Saginaw, Mich.
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.
Slocomb Co., J. T., Providence, R. I.

GAS Automobile & Tractor Lighting
Linde Air Products Co., N. Y. C.
Union Carbide & Carbon Corp., N. Y. C.

GAS, Compressed Welding and Cutting
Linde Air Produts Co., The, N. Y. C.
Union Carbide & Carbon Co., N. Y. C.

GEAR Blanks, Composition
Bakelite Corp., N. Y. C.
Chicago Rawhide Mfg. Co., Chicago

GEAR Burnishing Machines
Fellows Gear Shaper Co., Springfield, Vt.
Gleason Wks., Rochester, New York

GEAR Cutting Machines
Adams Co., Dubuque, Ia.
Brown & Sharpe Mfg. Co., Providence
Fellows Gear Shaper Co., Springfield, Vt.
Gleason Works, Rochester, N. Y.
Scherr Co., Geo., N. Y. C.
Waltham Mach. Works, Waltham, Mass.,

GEAR Lapping Machines
Fellows Gear Shaper Co., Springfield, Vt.

GEAR Measuring Machines
Fellows Gear Shaper Co., Springfield, Vt.

GEAR Tempering Machines
Gleason Wks., Rochester, N. Y.

GEAR Testing Machines
Brown & Sharpe Mfg. Co., Providence, R. I.
Fellows Gear Shaper Co., Springfield, Vt.
Gleason Wks., Rochester, N. Y.

GEARS, Cast
Ganschow Gear Co., Chicago
General Electric Co., Schenectady, N. Y.
Grant Gear Works, Boston, Mass.
Hartford Special Machy. Co., Hartford, Conn.
Perkins Mach. & Gear Co., Springfield, Mass.
Philadelphia Gear Wks., Phila., Pa.

GEARS, Cut
Adams Company, Dubuque, Pa.
Boston Gear Works, Inc., North Quincy, Mass.
Baush Mach. Co., Springfield, Mass.
Brown & Sharpe Mfg. Co., Providence
Chicago Rawhide Mfg. Co., Chicago
Cincinnati Gear Co., Cincinnati
Earle Gear & Mach. Co., Phila., Pa
Fellows Gear Shaper Co., Springfield, Vt.
Ganschow Gear Co., Chicago.
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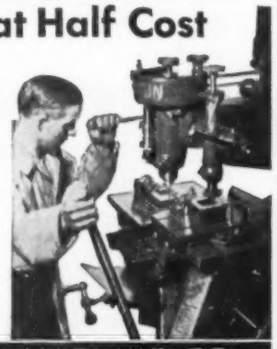

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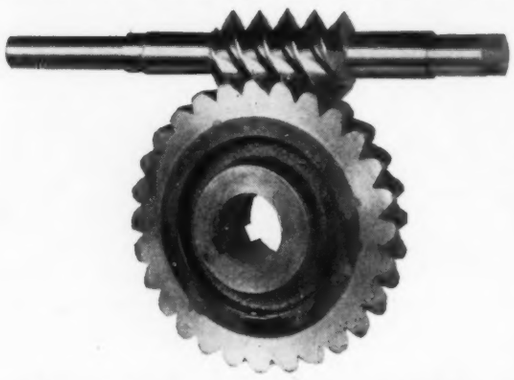

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Massachusetts Gear & Tool Co, Woburn, Mass
Meisel Press Mfg. Co., Boston, Mass.
Perkins Mach. & Gear Co., Springfield, Mass.
Philadelphia Gear Wks., Phila., Pa.

GEARS, Non-Metallic
Boston Gear Works, Inc., North Quincy, Mass.
Chicago Rawhide Mfg. Co., Chicago
James Co., D. O., Chicago
Massachusetts Gear & Tool Co, Woburn, Mass.
Perkins Mach. & Gear Co., Springfield, Mass.

GENERATORS, Acetylene
Linde Air Products Co., The, N. Y. C.
Union Carbide & Carbon Corp., N. Y. C.

GENERATORS, Electric
Century Electric Co., St. Louis, Mo.
General Electric Co., Schenectady, N. Y.

Goggles, Safety
American Optical Co., Southbridge, Mass.

GRINDERS, Bench
Black & Decker Mfg. Co., Towson, Md.

GRINDERS, Port, Electric
Black & Decker Mfg. Co., Towson, Md.

GRINDING Machines Attachments
Cincinnati Grinder, Inc., Cincinnati

GRINDING Machines, Abrasive Belt
Production Mach. Co, Greenfield, Mass.

GRINDING Machines, Bench
Norton Co., Worcester, Mass.
Union Twist Drill Co., Athol, Mass.

GRINDING Machines, Discs
Production Mach. Co., Greenfield, Mass

GRINDING Machines, Centerless
Cincinnati Grinders Inc., Cincinnati

GRINDING Machines, Chaser
Landis Mach. Co., Waynesboro, Pa.

GRINDING Machines, Chucking
Blanchard Mach. Co., Cambridge, Mass.
Bryant Chucking Grinder Co., Springfield, Vt.
Heald Mach. Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.

GRINDING Machines, Contour
Baker Bros. Inc., Toledo

GRINDING Machines, Cutter & Tool
Brown & Sharpe Mfg. Co., Providence, R. I.
Bryant Chucking Grinder Co., Springfield, Vt.
Cincinnati Milling Mach. Co., Cincinnati
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Geometric Tool Co., New Haven, Conn.
Gorton Mach. Co., Geo., Racine, Wis.
Heald Mach. Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Le Blond Mach. Tool Co., R. K., Cincinnati
Norton Co., Worcester, Mass.
Oliver Instrument Co., Adrian, Mich.
Pratt & Whitney, Div. Niles-Bement Pond Co., Hartford, Conn.
Sellers & Co., Inc., Wm., Philadelphia
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.

GRINDING Machines, Cylinder
Bryant Chucking Grinder Co., Springfield, Vt.
Heald Mach. Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.

GRINDING Machines, Cylindrical
Brown & Sharpe Mfg. Co., Providence
Cincinnati Grinders Inc., Cincinnati,
Heald Mach. Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Norton Co., Worcester, Mass.

GRINDING Machines, Die
Abrasive Mach. Tool Co., E. Providence, R. I.
Blanchard Mach. Co., Cambridge, Mass.
Bryant Chucking Grinder Co., Springfield, Vt.
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Heald Mach. Co., Worcester, Mass.
Landis Mach. Co., Waynesboro, Pa.
Murchey Machine Tool Co., Detroit, Mich.
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.
Rivett Lathe & Grinder, Inc., Boston, Mass.

GRINDING Machines, Drill
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Oliver Instrument Co., Adrian, Mich.
Sellers & Co., Inc., Wm., Phila., Pa.

GRINDING Machines, Electric
Arter Grinding Machine Co., Worcester, Mass.

GRINDING Machines, Face or Ring Wheel
Abrasive Mach. Tool Co., E. Providence, R. I.
Blanchard Mach. Co., Cambridge, Mass.

GRINDING Machines, Floor
Norton Co., Worcester, Mass.

GRINDING Machines, Gage
Abrasive Mach. Tool Co., E. Providence, R. I.
Landis Tool Co., Waynesboro, Pa.

GRINDING Machines, Gear
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.

GRINDING Machines, Head and End
Arter Grinding Mach. Co., Worcester, Mass.

GRINDING Machines, Hole and Face
Bryant Chucking Grinder Co., Springfield, Vt.

GRINDING Machines, Hydraulic
Cincinnati Grinders Inc., Cincinnati

GRINDING Machines, Internal
Bryant Chucking Grinder Co., Springfield, Vt.
Heald Machine Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Rivett Lathe & Grinder, Inc., Boston, Mass.

GRINDING Machines, Piston Rings
Heald Machine Co., Worcester, Mass.

GRINDING Machines, Plain
Brown & Sharpe Mfg. Co., Providence
Cincinnati Grinders Inc., Cincinnati

GRINDING Machines, Portable
Van Dorn Elec. Tool Co., Cleveland, O.

GRINDING Machines, Pulley
Abrasive Mach. Tool Co., E. Providence, R. I.

GRINDING Machines, Roll
Cincinnati Grinders, Inc., Cincinnati

GRINDING Machines, Surface
Abrasive Mach. Tool Co., E. Providence, Mass.
Blanchard Mach. Co., Cambridge, Mass.
Brown & Sharpe Mfg. Co., Providence
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Heald Machine Co., Worcester, Mass.
Norton Company, Worcester, Mass.
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.
Walker Co., O. S., Worcester, Mass.

WHERE-TO-BUY DIRECTORY

A Classified Index of Advertisers in this Issue

GRINDING Machines, Tap
Gallmeyer & Livingston Co., Grand Rapids, Mich.
Oliver Instrument Co., Adrian, Mich.

GRINDING Machines, Toolroom
Bryant Chucking Grinder Co., Springfield, Vt.

GRINDING Machines, Universal
Brown & Sharpe Mfg. Co., Providence
Cincinnati Grinders Inc., Cincinnati
Gallmeyer & Livingston, Co., Grand Rapids, Mich.
Le Blond Mach. Tool Co., R. K., Cincinnati
Norton Co., Worcester, Mass.

GRINDING Machines, Vertical
Blanchard Mach. Co., Cambridge, Mass.
Cincinnati Bickford Tool Co., Cincinnati
Walker Co., O. S., Worcester, Mass.

GRINDING Wheels
Blanchard Mach. Co., Cambridge, Mass.
Norton Co., Worcester, Mass.
Vitrified Wheel Co., Westfield, Mass.

GROUND Flat Stock
Brown & Sharpe Mfg. Co., Providence, R. I.

HAMMERS, Portable Electric
Black & Decker Mfg. Co., Towson, Md.

HAMMERS, Power
Sellers & Co., Inc., Wm., Phila., Pa.

HAMMERS, Soft-faced
Greene Tweed & Co., N. Y. C.

HANGERS
Brown & Sharpe Mfg. Co., Providence, R. I.

HANGERS, Shaft
Standard Pressed Steel Co., Jenkintown, Pa.

HARDNESS Measuring Instruments
Shore Instrument & Mfg. Co., Jamaica, L. I.
Wilson Mech. Instrument Co., N. Y. C.

HEAT Treating
American Metal Treatment Co., Elizabeth, N. J.

HEAT Treating Baths
Holden Co., A. F., Detroit

HOBBING Machines
Adams Company, Dubuque, Ia.
Brown & Sharpe Mfg. Co., Providence
Scherr Co., George, N. Y. C.

HOBS
Brown & Sharpe Mfg. Co., Providence
Union Twist Drill Co., Athol, Mass.
Philadelphia Gear Wks., Phila., Pa.
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.

HOISTS and Cranes, Electric and Traveling
Philadelphia Gear Wks., Phila., Pa.

HOISTS, Hand
Wright Mfg. Co. (Div. American Chain Co.), York, Pa.

HOLDERS, Pneumatic
Chicago Pneumatic Tool Co., N. Y. C.

HONING Machines
Barnes Drill Co., Rockford
Micromatic Hone Corp., Detroit, Mich.

HOSE, Flexible & Metallic
Chicago Metal Hose Corp., Maywood, Ill.

HYDRAULIC Machinery
Oilgear Corp., Milwaukee, Wis.

INDICATORS, Speed and Test
Brown & Sharpe Mfg. Co., Providence

INSTRUMENTS, Precision
Zeiss Inc., Carl., New York City, N. Y.

JIG Borers
Fosdick Mach. Tool Co., Cincinnati, Ohio

JOINTS, Universal
Bausch Mach. Tool Co., Springfield, Mass.
Boston Gear Works, Inc., North Quincy, Mass.
Gray & Prior Mach. Co., Hartford, Conn.
National Automatic Tool Co., Richmond, Ind.

KEYSEATING Machines
Baker Bros., Inc., Toledo
Davis Keyseater Co., Rochester, N. Y.
Mitts & Merrill, Saginaw, Mich.
National Mach. Tool Co., Cincinnati

LAMPS, Electric
General Electric Co., Schenectady, N. Y.

LAPPING Machines, Centerless
Cincinnati Grinders Inc., Cincinnati

LAPPING Machines, Cylindrical and Flat
Norton Co., Worcester, Mass.

LATHE Attachments
Gisholt Machine Co., Madison, Wis.

LATHE Tools
Gisholt Machine Co., Madison, Wis.
R & L Tools, Nicetown, Phila.
Ready Tool Co., Bridgeport, Conn.

LATHES, Automatic and Semi-Automatic
Jones & Lamson Mach. Co., Springfield, Mass.
Le Blond Mach. Tool Co., R. K., Cincinnati
Lodge & Shipley Mach. Tool Co., Cincinnati
Potter & Johnston Mach. Co., Pawtucket, R. I.
Pratt & Whitney Co., Div., Niles-Bement-Pond, Hartford, Conn.

LATHES, Bench
LeBlond Mach. Tool Co., R. K., Cincinnati
Pratt & Whitney Co., Div. Niles-Bennett-Pond Co., Hartford, Conn.
Rivett Lathe & Grinder, Inc., Boston
South Bend Lathe Works, South Bend, Ind.

LATHES, Brass Workers
Gisholt Machine Co., Madison, Wis.

LATHES, Engine
American Tool Works Co., Cincinnati
Cincinnati Lathe & Tool Co., Oakley, Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Le Blond Mach. Tool Co., R. K., Cincinnati, O.
Lodge & Shipley Mach. Tool Co., Cincinnati, O.
Modern Tool Works, Rochester, N. Y.
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.
South Bend Lathe Works, South Bend, Ind.
Springfield Mach. Tool Co., Springfield.

LATHES, Horizontal and Vertical Turret
Warner & Swasey Co., Cleveland

LATHES, Toolroom
American Tool Wks. Co., Cincinnati
Cincinnati Lathe & Tool Co., Oakley, Cincinnati
Le Blond Mach. Tool Co., R. K., Cincinnati
Lodge & Shipley Mach. Tool Co., Cincinnati
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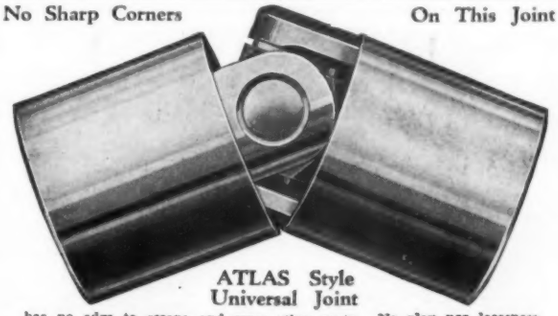

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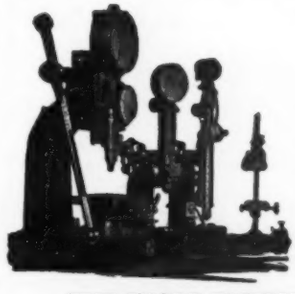

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WHERE-TO-BUY DIRECTORY

A Classified Index of Advertisers in this Issue

Springfield Mach. Tool Co., Springfield, O.
Bullard Co., Bridgeport, Conn.

LATHES, Wheel, R. R.
Sellers & Co., Inc., Wm., Phila., Pa.

LEATHER, Hydraulic
Chicago Rawhide Mfg. Co., Chicago

LOCK Washers
American Nut & Bolt Fastener Co., Pittsburgh
Real Tool Co., East Alton, Ill.
Butcher & Hart Mfg. Co., Toledo
Eaton Mfg. Co., Massillion, O.
Hobbs Mfg. Co., Worcester, Mass.
National Lock Washer Co., Newark, N. J. and Milwaukee, Wis.
Philadelphia Steel & Wire Corp., Germantown, Phila.
Positive Lock Washer Co., Newark, N. J.
Ryerson & Sons, Inc., J. T., Chicago
Washburn Co., Worcester, Mass.

LUBRICANTS
Oakite Products, Inc., N. Y. C.
Stuart Co., D. A., Chicago

LUBRICATING Systems
Rivett Lathe & Grinder, Inc., Boston

MACHINES, Shapecutting Oxy-Acetylene
Linde Air Products Co., N. Y. C.
Union Carbide & Carbon Corp., N. Y. C.

MACHINE Automatic Toolroom
Pratt & Whitney Div., Niles-Bennett-Pond Co., Hartford, Conn.

MACHINISTS' Tools
Brown & Sharpe Mfg. Co., Providence, R. I.

MANDRELS
Brown & Sharpe Mfg. Co., Providence, R. I.
Firth-Sterling Steel Co., McKeesport, Pa.
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.

MARKING MACHINES
Noble & Westbrook Mfg. Co., Hartford, Conn.

MEASURING Instruments
Norma-Hoffman Bearings Corp., Stamford, Conn.
Scherr Co., George, N. Y. C.

MEASURING Machines
Hanson-Whitney Mach. Co., Hartford, Conn.

MELTING Pots
Hones, Inc., Chas. A., Baldwin, N. Y.

METAL, Perforated
Ryerson & Son, Inc., J. T., Chicago

METALLIC Tubing, Flexible
Titeflex Metal Hose Co., Newark, N. J.

MICROMETERS
Brown & Sharpe Mfg. Co., Providence
Lufkin Rule Co., Saginaw, Mich.
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.

MILLING Attachments
Adams Co., Dubuque, Ia.
Brown & Sharpe Mfg. Co., Providence
Cincinnati Milling Mach. Co., Cincinnati
Kearney & Trecker Corp., Milwaukee, Wis.
Potter & Johnston Mach. Co., Pawtucket, R. I.

MILLING Machines, Automatic and Semi-Automatic
Brown & Sharpe Mfg. Co., Providence
Cincinnati Milling Mach. Co., Cincinnati
Kearney & Trecker Corp., Milwaukee, Wis.

MILLING Machines, Bench
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.
Sundstrand Mach. Tool Co., Rockford, Ill.

MILLING Machines, Continuous
Consolidated Mach. Tool Corp., Rochester, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Modern Tool Wks., Rochester, N. Y.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Sundstrand Mach. Tool Co., Rockford, Ill.

MILLING Machines, Drum Type
Consolidated Mach. Tool Corp., Rochester, N. Y.
Modern Tool Wks., Rochester, N. Y.

MILLING Machines, Duplex
Cincinnati Milling Mach. Co., Cincinnati
Kearney & Trecker Corp., Milwaukee, Wis.

MILLING Machines, Floor Type
Sellers & Co., Inc., Wm., Phila., Pa.

MILLING Machines, Hand
Kent-Owens Mach. Co., Toledo, Ohio
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.

MILLING Machines, Multiple Spindle
Cincinnati Milling Mach. Co., Cincinnati

MILLING Machines, Plain
Brown & Sharpe Mfg. Co., Providence
Cincinnati Milling Mach. Co., Cincinnati
Kearney & Trecker Corp., Milwaukee,
Kent-Owens Mach. Co., Toledo, Ohio
Wis.
Knight Machy. Co., W. B., St. Louis, Mo.
Potter & Johnston Mach. Co., Pawtucket, R. I.
Sundstrand Mach. Tool Co., Rockford, Ill.

MILLING Machines, Planetary
Consolidated Mach. Tool Corp., Rochester, N. Y.
Modern Tool Wks., Rochester, N. Y.

MILLING Machines, Planer Type
Cincinnati Planer Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Modern Tool Wks., Rochester, N. Y.
Niles Tool Wks. Co., Hamilton, O.
Putnam Mach. Co., Hamilton, O.
Sellers & Co., Inc., Wm., Phila., Pa.

MILLING Machines, Precision Brush
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.

MILLING Machines, Profile
Consolidated Mach. Tool Corp., Rochester, N. Y.
Modern Tool Wks., Rochester, N. Y.

MILLING Machines, Thread
Adams Co., Dubuque, Iowa
Hanson-Whitney Mach. Co., Hartford, Conn.
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.

MILLING Machines, Universal
Brown & Sharpe Mfg. Co., Providence
Cincinnati Milling Mach. Co., Cincinnati
Gorton Mach. Co., Geo., Racine, Wis.
Kearney & Trecker Corp., Milwaukee, Wis.
Knight Machy. Co., W. B., St. Louis, Mo.

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A Classified Index of Advertisers in this Issue

Potter & Johnston Mach. Co., Pawtucket, R. I.
Sundstrand Mach. Tool Co., Rockford, Ill.

MILLING Machines, Vertical
Brown & Sharpe Mfg. Co., Providence
Cincinnati Milling Mach. Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Gorton Mach. Co., Geo., Racine, Wis.
Kearney & Trecker Corp., Milwaukee, Wis.
Knight Machy. Co., W. B., St. Louis, Mo.
Modern Tool Works, Rochester, N. Y.
Potter & Johnson Mach. Co., Pawtucket, R. I.
Sundstrand Mach. Tool Co., Rockford, Ill.

MILLING Machines, Worm
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.

MOTORS, Electric
Century Electric Co., St. Louis, Mo.
General Electric Co., Schenectady, N. Y.

MOTORS, Fractional Horsepower
Bodine Corp., Bridgeport, Conn.

NITROGEN Gas
Air Reduction Sales Co., N. Y. C.
Linde Air Products Co., The, N. Y. C.
Union Carbide & Carbon Corp., N. Y. C.

NUMBERING Machines
Noble & Westbrook Mfg. Co., Hartford, Conn.

NUT Runners, Port, Electric
Black & Decker Mfg. Co., Towson, Md.

OIL and Grease Cups
Gits Bros. Mfg. Co., Chicago

OIL Extractors, Centrifugal
Barrett Co., Leon J., Worcester, Mass.

OIL Grooving Machines
National Mach. Tool Co., Cincinnati

OIL Seals
Chicago Rawhide Mfg. Co., Chicago

OIL Stones
Norton Co., Worcester, Mass.

OILS, Cutting
Stuart Co., D. A., Chicago

OILS, Lubricating
Stuart Co., D. A., Chicago

OILS, Quenching
Stuart Co., D. A., Chicago

OXYGEN Gas
Air Reduction Sales Co., N. Y. C.
Linde Air Products Co., The, N. Y. C.
Union Carbide & Carbon Corp., N. Y. C.

PARALLELS
Brown & Sharpe Mfg. Co., Providence, R. I.

PILLOW Blocks
Boston Gear Works, Inc., North Quincy, Mass.

PIPE, Cutters, Hand
Ridge Tool Co., Elyra, O.

PIPE Cutting and Threading Machines
Merrell Mfg. Co., Toledo
Murchey Machine Tool Co., Detroit, Mich.
Oster Mfg. Co., Cleveland

PIPE Fitters Tools
Standard Tool Co., Cleveland

PIPE Plugs
Allen Mfg. Co., Hartford, Conn.

PIPE Steel
National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh

PLANERS
Ohio Machine Tool Co., Kenton, Ohio

PLANING Machines
Cincinnati Planer Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Modern Tool Wks., Rochester, N. Y.
Niles Tool Wks. Co., Hamilton, O.
Putnam Mach. Co., Hamilton, O.
Sellers & Co., Inc., Wm., Phila., Pa.

PLATES, Aluminum
Aluminum Co. of America, Pittsburgh

PLATES, Steel
Carnegie-Illinois Steel Corp, Pittsburgh

PNEUMATIC Tools
Ingersoll-Rand Co., N. Y. C.

POLISHING and Buffing Machines
Heald Mach. Co., Worcester, Mass.
Landis Tool Co., Waynesboro, Pa.
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.
Production Mach. Co., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.
Van Dorn Elec. Tool Co., Cleveland, O.

PRESS Feeds
V & O Press Co., Hudson, N. Y.

PRESSES, Forcing
Lucas Mach. Tool Co., Cleveland
Oilgear Corp., Milwaukee, Wis.

PRESSES, Hydraulic
Oilgear Corp., Milwaukee, Wis.

PRESSES, Power
Cincinnati Shaper Co., Cincinnati
Oilgear Corp., Milwaukee, Wis.
V & O Press Co., Hudson, N. Y.
Zeh & Hanhemann Co., Newark, N. J.

PRESSES, Tablet
Kux-Lohner Mach. Co., Chicago

PROFILING Machines
Gorton Mach. Co., Geo., Racine, Wis.

PROTRACTORS
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.

PULLEYS
Johnson Mach. Co., Carlyle, Manchester, Conn.

PUMPS, Centrifugal
Brown & Sharpe Mfg. Co., Providence

PUMPS, Hydraulic
Elmes Engineering Works, Chas. F., Chicago, Ill.
Oilgear Corp., Milwaukee, Wis.
Vickers, Inc., Detroit, Mich.

PUMPS Lubricants
Brown & Sharpe Mfg. Co., Providence
Ruthman Mach. Co., Cincinnati
Vickers, Inc., Detroit, Mich.

PUMPS, Oil
Brown & Sharpe Mfg. Co., Providence
Ruthman Mach. Co., Cincinnati, O.
Vickers, Inc., Detroit, Mich.

PUMPS, Power
Oilgear Corp., Milwaukee, Wis.
Vickers, Inc., Detroit, Mich.

PUNCHES, Center
Lufkin Rule Co., Saginaw, Mich.
Starrett Co., L. S., Athol, Mass.

PUNCHES, Power
Mitts & Merrill, Saginaw, Mich.
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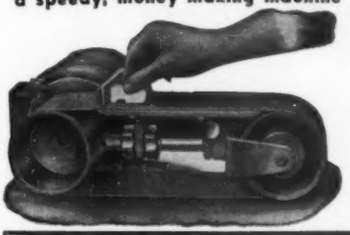
No. 601 Abrasive Belt Polisher-Surfacer

a speedy, money making machine for small part finishing



Its handiness is exceeded only by its fast performance and economical operation. Finishes castings, removes burrs, straightens dies, stampings, etc., quickly and at low cost. Gives straight line finish and leaves sharp edges. Priced low . . . sturdily built . . . eliminates hand labor . . . reduces labor costs. Other belt Surfaces 4 to 20" wide. Send for illustrated descriptive bulletin.

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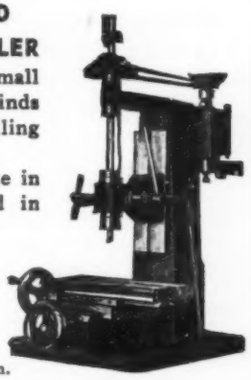

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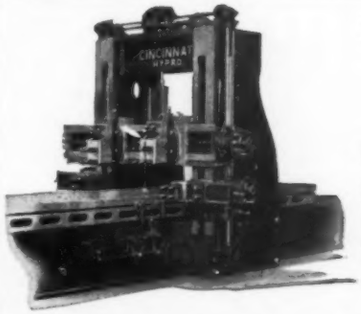

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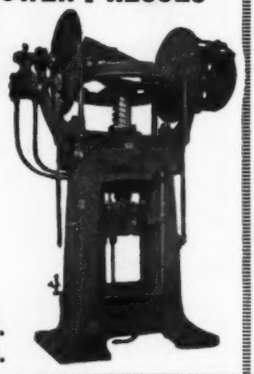

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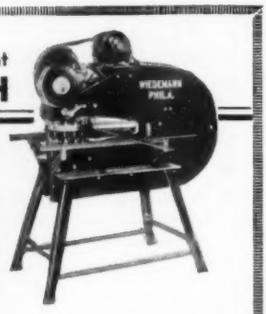
a powerful motor driven deep throat
TURRET PUNCH



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THE V & O Press Co.
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WHERE-TO-BUY DIRECTORY

A Classified Index of Advertisers in this Issue

PUNCHING and Shearing Machines
Consolidated Mach. Tool Corp., Rochester, N. Y.
Kent-Owens Mach. Co., Toledo, Ohio
Modern Tool Wks., Rochester, N. Y.

REAMERS
Firth-Sterling Steel Co., McKeesport, Pa.

REAMERS, Adjustable
Butterfield Div. Union Twist Drill Co., Derby Line, Vt.
Gammons-Holman Co., Manchester, Conn.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Hartford Conn. (Div. Niles-Bement-Pond.)

REAMERS, Solid
Butterfield Div. Union Twist Drill Co., Derby Line, Vt.
Gammons-Holman Co., Manchester, Conn.
Holman Reamer Co., Manchester, Conn.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.

REAMING Machines
Blanchard Mach. Co., Cambridge, Mass.

REGULATORS Acetylene, Oxygen
Linde Air Products Co., N. Y. C.
Union Carbide & Carbon Corp., N. Y. C.
Allen-Bradley Co., Milwaukee

RHEOSTATS
General Electric Co., Schenectady, N. Y.

RIVETING Machines
Grant Mfg. & Mach. Co., Bridgeport, Conn.
Linley Bros. Co., Bridgeport, Conn.

RODS Welding
Lincoln Electric Co., Cleveland, Ohio
Linde Air Products Co., The, N. Y. C.
Union Carbide & Carbon Corp., N. Y. C.

RULES, Steel
Brown & Sharpe Mfg. Co Providence, R. I.

RULES, Steel & Wood
Lufkin Rule Co., Saginaw, Mich.

RUST Preventives
Oakite Products, Inc., N. Y. C.

SANDERS, Portable, Electric
Black and Decker Mfg. Co., Towson, Md.
Eisler Eng'r. Co., Newark, N. J.

SAW Frames & Blades, Hack
Starrett Co., L. S. Athol, Mass.

SAWING Machines, Band
Armstrong-Blum Mfg. Co., Chicago

SAWING Machines, Power Hack
Armstrong-Blum Mfg. Co., Chicago
Earle Gear & Mach. Co., Phila., Pa.
Peerless Machine Co., Racine, Wis.

SAWS, Hack
Armstrong-Blum Mfg. Co., Chicago
Black & Decker Mfg. Co., Towson, Md.

SAW, Metal Slitting
Pratt & Whitney (Div. Niles-Bennett-Pond Co., Hartford, Conn.

SAWS, Milling
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.

SAWS, Screw Slotting
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.

SCREW Drivers, Automatic
Errington Mech. Lab., Staten Island, N. Y.

SCREW Drivers, Portable, Electric
Black & Decker Mfg. Co., Towson, Md.

SCREW Machine Tools & Attachments
Brown & Sharpe Mfg. Co., Providence
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.

SCREW Machine Work
Eastern Mach. Screw Corp., New Haven, Conn.
National Mach. Tool Co., Cincinnati
Taft-Peirce Mfg. Co., Woonsocket, R. I.

SCREW Machines
Allen Mfg. Co., Hartford, Conn.
Brown & Sharpe Mfg. Co., Providence, R. I.
Eastern Mach. Screw Corp., New Haven, Conn.
Greenlee Bros. & Co., Rockford, Ill.

SCREW Machines, Automatic & Semi-Automatic
Brown & Sharpe Mfg. Co., Providence
Cone Automatic Mach. Co., Windsor, Vt.

SCREW Machines, Plain or Hand
Jones & Lamson Mach. Co., Springfield, Mass.
Warner & Swasey Co., Cleveland

SCREW Plates
Butterfield Div. Union Twist Drill Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Morse Twist Drill & Mach. Co., New Bedford, Mass.

SCREW Threading Machines.
Brown & Sharpe Mfg. Co., Providence

SCREWS, Cap and Set
Allen Mfg. Co., Hartford, Conn.
Danly Mach. Specialties Co., Inc. Chicago
Eastern Mach. Screw Corp., New Haven, Conn.
Strong Carlisle & Hammond Co Cleveland, O.

SCREWS, Safety
Standard Pressed Steel Co., Jenkintown, Pa.
Strong Carlisle & Hammond Co., Cleveland, O.

SCREWS, Shoulder
Allen Mfg. Co., Hartford, Conn.

SHAFTING
Bliss & Laughlin, Inc., Harvey, Ill., and Buffalo, N. Y.
National Tube Co., Pittsburgh
Ryerson & Son., Inc., Jos. T., Chicago

SHAPERS
American Tool Wks. Co., Cincinnati
Hanson-Whitney Mach. Co., Hartford, Conn.
Ohio Machine Tool Co., Kenton, Ohio
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.

SHAPERS, Structural Steel
Carnegie-Illinois Steel Corp., Pittsburgh

SHAPERS
Cincinnati Shaper Co., Cincinnati
Potter & Johnston Mach. Co., Pawtucket, R. I.
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.
Smith & Mills Co., Cincinnati
Springfield Mach. Tool Co., Springfield, O.

WHERE-TO-BUY DIRECTORY

A Classified Index of Advertisers in this Issue

SHEARS, Power
Cincinnati Shaper Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Mitts & Merrill, Saginaw, Mich.
Modern Tool Wks., Rochester, N. Y.

SHEET Metal Working Machinery
Andrew C. Campbell Co., Bridgeport, Conn.
Cincinnati Shaper Co., Cincinnati

SHIMS, Laminated
Laminated Shim Co., Inc., Long Island City, N. Y.

SLOTTING Machines
Consolidated Mach. Tool Corp., Rochester, N. Y.
Modern Tool Wks., Rochester, N. Y.

SOCKETS, Detachable, Hand
Armstrong Brothers Tool Co., Chicago

SOCKETS and Sleeves
Standard Tool Co., Cleveland

SPEED Reducers
Adams Co., Dubuque, Ia.
Boston Gear Works, Inc., North Quincy, Mass.
Cullman Wheel Co., Chicago
Earle Gear & Mach. Co., Philadelphia
Grant Gear Works, Boston
Hartford Special Mach. Co., Hartford, Conn.
James Co., D. O., Chicago
Morse Chain Co., Ithaca, N. Y.
Philadelphia Gear Wks., Phila., Pa.

SPEED Reducers, Motorized
James Co., D. O., Chicago

SPINDLES, Lathe and Milling Machine, Hollow Bored
American Hollow Boring Co., Erie, Pa.

SPRING Washers
American Nut & Bolt Fastener Co., Pittsburgh
Beall Tool Co., East Alton, Ill.
Butcher & Hart Mfg. Co., Toledo
Eaton Mfg. Co., Massillon, O.
Hobbs Mfg. Co., Worcester, Mass.
National Lock Washer Co., Newark, N. J. and Milwaukee, Wis.
Philadelphia Steel & Wire Corp., Germantown, Phila.
Positive Lock Washer Co., Newark, N. J.
Washburn Co., Worcester, Mass.

SPROCKETS
Boston Gear Works, Inc., North Quincy, Mass.
Cullman Wheel Co., Chicago
Grant Gear Wks., Boston
James Co., D. O., Chicago
Morse Chain Co., Ithaca, N. Y.
Philadelphia Gear Works, Phila., Pa.

SQUARES
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.

STAMPS, Steel
Noble & Westbrook Mfg. Co., Hartford, Conn.

STEEL, Alloy, Carbon
Bliss & Laughlin, Inc., Harvey, Ill., and Buffalo, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.

STEEL, Alloy Cold Drawn
Bliss & Laughlin, Inc., Harvey, Ill., and Buffalo, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Ryerson & Son, Inc., Jos. T., Chicago

STEEL, Cold Finished
Bliss & Laughlin, Inc., Harvey, Ill., and Buffalo, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Ryerson & Son, Inc., Jos. T., Chicago
Wyckoff Drawn Steel Co., Pittsburgh

STEEL, Die
Firth-Sterling Steel Co., McKeesport, Pa.

STEEL, High Speed
Armstrong Bros. Tool Co., Chicago
Firth-Sterling Steel Co., McKeesport, Pa.
Ryerson & Son, Inc., Jos. T., Chicago

STEEL, Rustless and Stainless
Firth-Sterling Steel Co., McKeesport, Pa.
Ingersoll Steel & Disc Corp., New Castle, Ind.
Rustless Iron & Steel Corp., Baltimore, Md.
Ryerson & Son, Inc., Jos. T., Chicago

STEEL Screw
Bliss & Laughlin, Inc., Harvey, Ill., and Buffalo, N. Y.
Wyckoff Drawn Steel Co., Pittsburgh

STEEL Setters
Errington Mech. Lab., Staten Island, N. Y.

STEEL Sheets
Jessop Steel Co., Washington, Pa.

STEEL, Stainless
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop Steel Co., Washington, Pa.

STEEL, Tool
Armstrong Bros. Tool Co., Chicago
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop Steel Co., Washington, Pa.
Ryerson & Son, Inc., Jos. T., Chicago

STEELS, Alloy, Carbon and High Speed
Carnegie-Illinois Steel Corp., Pittsburgh
Firth-Sterling Steel Co., McKeesport, Pa.
Jessop Steel Co., Washington, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.

STRAIGHT Edges
Brown & Sharpe Mfg. Co., Providence, R. I.

STRAIGHTENING Machinery
Springfield Mach. Tool Co., Springfield, Ohio

STRUCTURAL Shapes
Aluminum Co. of America, Pittsburgh

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Danly Mach. Specialties Co., Inc., Chicago
Racine Tool & Mach. Co., Racine, Wis.

SURFACE Plates
Brown & Sharpe Mfg. Co., Providence, R. I.

SWAGING Machines
Torrington Co., Torrington, Conn.

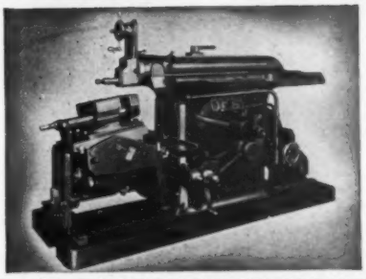
TACHOMETERS
Brown Instr. Co., Philadelphia

TANKS, Aluminum
Aluminum Co. of America, Pittsburgh

TAP Extensions
Allen Mfg. Co., Hartford, Conn.

TAP Holders
Errington Mech. Lab., Staten Island, N. Y.

"OHIO" SHAPERS



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Chicago: John H. Glover, 2127 N. Sayre Ave., Chicago, Ill.
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Indiana: G. A. Richey, Chamber of Commerce Bldg., Indianapolis, Ind.
Pennsylvania: Arch Machinery Co., 1029 Park, Bldg., Pittsburgh, Pa.
New York State: Syracuse Supply Co., Syracuse and Buffalo, N. Y.
New England: Potter & Johnston Machine Co., Pawtucket, R. I.
California: C. F. Bulotti Machinery Co., 829-831 Folsom St., San Francisco, Calif. Eccles & Davies Machinery Co., Inc., 1910 Santa Fe Avenue, Los Angeles, Calif.
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Wednesday, January 5.

WHERE-TO-BUY DIRECTORY

A Classified Index of Advertisers in this Issue

TAPER Pins
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn.
Standard Tool Co., Cleveland

TAPES, Measuring
Lufkin Rule Co., Saginaw, Mich.

TAPPERS, Portable Electric
Black & Decker Mfg. Co., Towson, Md.

TAPPING Machines & Attachments
Errington Mech. Lab., Staten Island, N. Y.
Moline Tool Co., Moline, Ill.
Murchey Machine Tool Co., Detroit, Mich.

TAPPING Machines
Armstrong-Blum Mfg. Co., Chicago
Baker Bros., Inc., Toledo
Procunier Safety Chuck Co., Chicago

TAPPING Machines, Automatic and Semi-Automatic
Bausch Mach. Tool Co., Springfield, Mass.

TAPPING Machines and Attachments
Cincinnati Bickford Tool Co., Cincinnati
Kingsbury Mach. Tool Corp., Keene, N. H.
National Automatic Tool Co., Richmond, Ind.

TAPPING Machines, Multi-Spindle
Baker Bros., Inc., Toledo
Bausch Mach. Tool Co., Springfield, Mass.

TAPPING Machines, Nut
Acme Mach. Co., Cleveland

TAPPING Machines, Pipe Coupling
Acme Mach. Co., Cleveland

TAPS and Dies
Card Mfg. Co., S. W., Mansfield, Mass.
Geometric Tool Co., New Haven, Conn.
Hanson-Whitney Mach. Co., Hartford, Conn.
Landis Mach. Co., Waynesboro, Pa.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Murchey Machine Tool Co., Detroit, Mich.
Pratt & Whitney Co., Div. Niles-Bement-Pond, Hartford, Conn.
Standard Tool Co., Cleveland

TAPS, Collapsing
Landis Mach. Co., Waynesboro, Pa.
Murchey Machine Tool Co., Detroit, Mich.

TAPS, Ground
Butterfield Div. Union Twist Drill Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Hanson-Whitney Mach. Co., Hartford Conn.
Jones & Lamson Mach. Co., Springfield, Mass.
Morse Twist Drill & Mach. Co., New Bedford, Mass.

TESTING Apparatus, Hardness
Shore Instrument & Mfg. Co., Jamaica, L. I., N. Y.
Wilson Mech. Instrument Co., N. Y. C.

THREAD-CUTTING Machines
Acme Mach. Co., Cleveland
Eastern Mach. Screw Corp., New Haven, Conn.
Geometric Tool Co., New Haven, Conn.
Grant Mfg. & Mach. Co., Bridgeport, Conn.
Landis Mach. Co., Waynesboro, Pa.
Murchey Machine Tool Co., Detroit, Mich.
Oster Mfg. Co., Cleveland
Waltham Mach. Wks., Waltham Mass.

THREAD Cutting Tools
Eastern Mach. Screw Corp., New Haven, Conn.
Geometric Tool Co., New Haven, Conn.
Hanson-Whitney Mach. Co., Hartford, Conn.
Jones & Lamson Mach. Co., Springfield, Mass.
Landis Mach. Co., Waynesboro, Pa.
Murchey Machine Tool Co., Detroit, Mich.
Rivett Lathe & Grinder, Inc., Boston, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

THREADERS, Pipe
Armstrong Bros. Tool Co., Chicago

TONGS, Lifting
Armstrong Bros. Tool Co., Chicago

TOOL Bits
Firth-Sterling Steel Co., McKeesport, Pa.
Gisholt Machine Co., Madison, Wis.
Jessop Steel Co., Washington, Pa.
Linde Air Products Co., The, N. Y. C.

TOOL Holders
Armstrong Bros. Tool Co., Chicago
Gisholt Machine Co., Madison, Wis.
Ready Tool Co., Bridgeport, Conn.

TOOL Holder Bets
Firth-Sterling Steel Co., McKeesport, Pa.

TOOL WORK
Taft-Peirce Mfg. Co., Woonsocket, R. I.

TOOLS, Boring
Armstrong Bros. Tool Co., Chicago
Gisholt Machine Co., Madison, Wis.

TOOLS, Cutting-Off
Armstrong Bros. Tool Co., Chicago
Williams & Co., J. H., Buffalo, N. Y.

TOOLS, Diamond
Desmond-Stephan Mfg. Co., Urbana, O.

TOOLS, Knurling
Armstrong Bros. Tool Co., Chicago

TOOLS, Lathe
Armstrong Bros. Tool Co., Chicago
Gisholt Machine Co., Madison, Wis.

TOOLS, Planer
Armstrong Bros. Tool Co., Chicago

TOOLS, Pipe Threading
Armstrong Bros. Tool Co., Chicago

TOOLS, Safety
Williams & Co., J. H., Buffalo, N. Y.

TOOLS, Shaper
Armstrong Bros. Tool Co., Chicago

TOOLS, Turning
Firth-Sterling Steel Co., McKeesport, Pa.
R & L Tools, Nicetown, Phila.

TOOLS, Turret Lathe and Screw Machine
Armstrong Bros. Tool Co., Chicago
Gisholt Mach. Co., Madison, Wis.

TRANSFORMERS
General Electric Co., Schenectady, N. Y.

TRANSMISSION
Oilgear Corp., Milwaukee, Wis.

WHERE-TO-BUY DIRECTORY

A Classified Index of Advertisers in this Issue

TRANSMISSION Equipment
Boston Gear Works, Inc., North Quincy, Mass.
Morse Chain Co., Ithaca, N. Y.

TRUCKS, Electric
Wright-Hibbard Industrial Truck Co., Inc., Phelps, N. Y.

TUBING, Aluminum Seamless
Aluminum Co. of America, Pittsburgh

TUBING, Flexible Metallic
Chicago Metal Hose Corp., Maywood, Ill.
Titeflex Metal Hose Co., Newark, N. J.

TUBING, Seamless, Etc.
National Tube Co., Pittsburgh
Ryerson & Son, Inc., Jos., Chicago

TUNGSTEN Carbide Tools
Ex-Cell-O Aircraft & Tool Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.

TURBINES, Steam
General Electric Co., Schenectady, N. Y.

TURRETS, Tool Post
American Tool Wks. Co., Cincinnati
Gisholt Mach. Co., Madison, Wis.

UPSETTING and Forging Machines
Acme Machy. Co., Cleveland

USED Machinery
(See Searchlight Section)
Beatty Machine & Mfg. Co., Hammond, Ind.
Bernstein & Co., George M., Chicago, Ill.
Central Mach. Tool Corp., Toledo, O.
Cincinnati Machy. & Supply Co., Cincinnati
Delta Equipment Co., Phila., Pa.
Duquesne Electric Mfg. Co., Pittsburgh, Pa.
Dony Mach'ry Co., D. C., Rochester, N. Y.
Eastern Machinery Co., Cincinnati
Emerman & Co., Louis E., Chicago
Falk Mill Supply Co., Inc., Rochester, N. Y.
Ganey Machinery Co., Buffalo, N. Y.
George & Co., James W., Detroit, Mich.
Hill Clarke Machinery Co., Chicago
Hyman & Sons, Jos., Philadelphia
Indianapolis Machy. & Supply Co., Indianapolis, Ind.
Industrial Machy. Co., Indianapolis, Ind.
International Mach'ry Co., Detroit, Mich.
Interstate Machy. Co., Chicago
Iroquois Machy. Co., Buffalo, N. Y.
Jones Machine Tool Corp., Cincinnati, O.
Lucas & Son Inc., J. L., Bridgeport, Conn.
Marr-Galbreath Machy. Co., Pittsburgh
McDonald Machy. Co., St. Louis
Midwest Machy Co., Chicago, Ill.
Miles Machy. Co., Saginaw, W. S., Mich.
Morey & Co., Inc., N. Y. C.
Motor Repair & Mfg. Co., Cleveland
O'Brien Machinery Co., Phila., Pa.
Osborne & Sexton Machy. Co., Columbus, O.
Ott Machy. Sales Co., Detroit
Reliance Machy. Sales Co., Pittsburgh, Pa.
Simmons Machy. Tool Corp., Albany, N. Y.
Strong, Carlisle & Hammond Co., Cleveland
Sun Mach'ry Co., Inc., Newark, N. J.
Surplus Material & Machy. Co., Detroit, Mich.
Victor Machinery Co., Chicago, Ill.
West Penn Machy. Co., Pittsburgh

Valves, Hydraulic
Vickers, Inc., Detroit, Mich.

VERNIERS
Brown & Sharpe Mfg. Co., Providence, R. I.

VISES, Drilling Machines
Armstrong-Blum Mfg. Co., Chicago
Hartford Special Machy. Co., Hartford, Conn.

VISES, Machinist
Desmond-Stephan Mfg. Co., Urbana, Ohio
Wiedmann Machine Co., Phila., Pa.

VISES, Milling Machines
Brown & Sharpe Mfg. Co., Providence
Cincinnati Milling Mach. Co., Cincinnati
Hartford Special Machy. So., Hartford, Conn.

VISES, Pipe
Armstrong Bros. Tool Co., Chicago

WASHING and Drying Machines, Centrifugal
Barrett Co., Leon J. Worcester, Mass.

WELDERS, Electric
Ohio Machine Tool Co., Kenton, Ohio

WELDING APPARATUS, Electric Arc
Air Reduction Sales Co., N. Y. C.

WELDING APPARATUS, Oxy-Acetylene
Air Reduction Sales Co., N. Y. C.

WELDING Machines, Electric
General Electric Co., Schenectady, N. Y.

WELDING Machines, Oxy-Acetylene
Linde Air Products Co., The., N. Y. C.
Union Carbide & Carbon Corp., N. Y. C.

WELDING Rods
Ryerson & Son, Inc., Jos. T., Chicago

WELDING Supplies
Air Reduction Sales Co., N. Y. C.
Linde Air Products Co., The, N. Y. C.
Union Carbide & Carbon Corp., N. Y. C.

WELDING Wire and Flux
Aluminum Co. of America, Pittsburgh

WHEELS, Steam, Steel, Electric and Industrial
Carnegie-Illinois Steel Corp., Pittsburgh

WIRE Aluminum
Aluminum Co. of America, Pittsburgh

WIRE Copper
Firth-Sterling Steel Co., McKeesport, Pa.

WIRE, Stainless Steel
Ryerson & Son, Inc., Jos. T., Chicago

WORMS Drives
Gear Specialties, Inc., Chicago
Hartford Special Machy. Co., Hartford, Conn.
Perkins Mach. & Gear Co., Springfield, Mass.

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Gear Specialties, Inc., Chicago

WRENCHES, Machinist
Armstrong Bros. Tool Co., Chicago

WRENCHES, Pipe
Armstrong Bros. Tool Co., Chicago
Butterfield Div. Union Twist Drill Co., Derby Line, Vt.

WRENCHES, Ratchet
Greene, Tweed & Co., N. Y. C.

WRENCHES, Socket
Greene, Tweed & Co., N. Y. C.

WRENCHES, Socket, Portable Electric
Black & Decker Mfg. Co., Towson, Md.

WRENCHES Tap
Butterfield Div. Union Twist Drill Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
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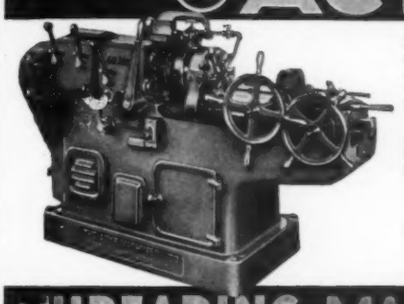

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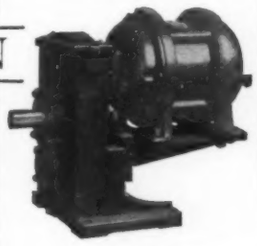

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ALPHABETICAL INDEX TO ADVERTISERS

	Page
Abrasive Machine Tool Co	60
Adams Company	45
Allen Mfg. Co	46
American Gas Furnace Co	66
Acme Machinery Co	85
American Hollow Boring Co	77
American Metal Treatment Co	71
American Optical Co	32
American Steel & Wire Co	34
American Tool Works Co	16
Armstrong-Blum Mfg. Co	66
Armstrong Bros. Tool Co	17
Bakelite Corp	22
Baker Bros., Inc (edit.)	1291
Barnes Drill Co	76
Barrett Co., Leon J	74
Baumbach Mfg. Co., E. A	77
Baush Machine Tool Co	80
Blackman & Nuetzel Machinery Co	48
Blakeslee, G. S., Co (edit.)	1300
Blanchard Machine Co	59
Bliss & Laughlin, Inc	45
Bodine Corp	76
Boston Gear Works, Inc (edit.)	1287
Brown & Sharpe Mfg. Co	20
Bryant Chucking Grinder Co	61
Buffalo Forge Co (edit.)	1283
Butterfield Div., Union Twist Drill Co	24
Card Mfg. Co., S. W	56
Carlton Machine Tool Co	76
Carnegie Illinois Steel Corp	34-39
Century Electric Co	63
Chicago Metal Hose Corp	46
Chicago Rawhide Mfg. Co	79
Cincinnati Bickford Tool Co. (edit.)	1306
Cincinnati Gear Co	45
Cincinnati Grinders Incorporated	12-13
Cincinnati Milling Machine Co	6-7
Cincinnati Planer Co	81
Cincinnati Shaper Co	37
Columbia Steel Co	34-39
Cone Automatic Machine Co	83
Consolidated Machine Tool Corp	76
Crafts Co., Arthur A	75
Cullman Wheel Co	85
Danly Machine Specialties Co., Inc	76
Davis Keyseater Co	80
Desmond-Stephan Mfg. Co	75
Dreses Machine Tool Co	77
Earle Gear & Machine Co	45
Eastern Machine Screw Corp	83
Errington Mechanical Laboratory	52
Federal Bearings Co., Inc	50
Fellows Gear Shaper Co	10-11
Firth-Sterling Steel Co	49
Foote-Burt Co	62
Gallmeyer & Livingston Co	78
Gammons-Holman Co	82
Ganschow Gear Co	44
Gear Specialties, Inc	44
General Electric Co	40-41
Geometric Tool Co	57
Gleason Works	3
Gorton Machine Co., Geo	77
Goss & DeLeeuw Machine Co	75
Grant Gear Works	45
Grant Mfg. & Machine Co	83
Gray & Prior Machine Co	79
Greene, Tweed & Co	56
Hanson-Whitney Machine Co	65
Hartford Special Machinery Co	44
Hartford Steel Ball Co	66
Heald Machine Co	2nd Cover
Holman Reamer Co	82
Hones, Inc., Chas. A	77
Hoover Ball & Bearing Co. (edit.)	1305
Jacobs Mfg. Co (edit.)	1304
James Mfg. Co., D. O	78
Jones & Lamson Machine Co	8-9
Johnson Machine Co., Carlyle	52
Kearney & Trecker Corp	21
Kent-Owens Machine Co	64
Kingsbury Machine Tool Corp.	85
Knight Machinery Co., W. B. (edit.)	1285
Kux-Lohner Machine Co	74
Landis Machine Co, Inc	14-15
Landis Tool Co	28
Latrobe Electric Steel Co	84
LeBlond Machine Tool Co, R. K. (edit.)	1289
Leland-Gifford Co	76
Lincoln Machine Co	71
Linde Air Products Co., The	29
Linley Brothers Co	81
Lodge & Shipley Machine Tool Co	4-5
Lucas Machine Tool Co	74
Lufkin Rule Co	1302
McGraw-Hill Book Co., Inc	73
Massachusetts Gear & Tool Co	45
Mechanite Institute of America	19
Meisel Press Mfg. Co	78
Merrell Mfg. Co	85
Mitts & Merrill	80
Morse Chain Co	3rd Cover
Morse Twist Drill & Machine Co	54
Murchey Machine & Tool Co	64
National Automatic Tool Co	35
National Machine Tool Co	81
National Tube Co	34
New Departure Div. General Motors Corp.	Front Cover
Nicholson File Co	38
Niles Tool Works Co	80
Noble & Westbrook Mfg. Co	80
Norma-Hoffmann Bearings Corp	51
Norton Co.	25
Oakite Products, Inc	48-75
Ohio Machine Tool Co	83
Oilgear Corp. (edit.)	1303
Oliver Instrument Co	84
Oster Mfg. Co (edit.)	1293
Perkins Machine & Gear Co	44
Philadelphia Gear Works	44
Phonograph Needle Mfg. Co	71
Potter & Johnston Machine Co	74
Pratt & Whitney Co., Div. Niles-Bement-Pond Co.	26-27
Production Machine Co	81
Putnam Machine Co	80
R. & L. Tools	55
Randall & Stickney	79
Ready Tool Co	84
Rivett Lathe & Grinder, Inc. (edit.)	1301
Ruthman Machinery Co.	52
Ryerson & Son, Inc., Jos. T. (edit.)	1297
Scherr Co., Geo	58
Sebastian Lathe Co	58
Sellers & Co., Inc., Wm	48
Shore Instrument & Mfg. Co	79
Smith & Mills Co	83
South Bend Lathe Works (edit.)	1299
Spring Washer Industry	23
Springfield Machine Tool Co	80
Standard Pressed Steel Co	47
Standard Tool Co	33
Tennessee Coal, Iron, & Ry. Co	39
Timken Roller Bearing Co	4th Cover
Titeflex Metal Hose Co	46
Torrington Co.	85
Union Carbide & Carbon Corp	29
Union Twist Drill Co	18
U. S. Steel Corp	34-39
U. S. Steel Products	34-39
Universal Engineering Co	74
V. & O. Press Co	82
Vickers, Inc.	42-43
Vitrified Wheel Co	60
Walker Co., O. S	58
Waltham Machine Works	64
Warner & Swasey Co	36
Wiedmann Machine Co	82
Wilson Mechanical Instrument Co	56
Wyckoff Drawn Steel Co (edit)	1298
Zeh & Hahnemann Co	82

■

SEARCHLIGHT SECTION

Classified Advertising

Classification	*Page*
BUSINESS OPPORTUNITIES	67
CONTRACT WORK	71
EMPLOYMENT SERVICE	67
PATENT ATTORNEY	67
POSITIONS VACANT	67
POSITIONS WANTED	67
SELLING OPPORTUNITIES	67
WANTED TO PURCHASE	67
USED AND SURPLUS EQUIPMENT	67-71
Beatty Machine & Mfg. Co	69
Central Machine Tool Corp	71
Cincinnati Machinery & Supply Co	68
Delta Equipment Co	70
Duquesne Electric & Mfg. Co	68
Eastern Machinery Co	69
Emerman & Co., Louis E	68-70
George & Co., James W	70
Hill-Clark Machinery Co	69
Hyman & Sons, Joseph	68
Indianapolis Machy. & Supply Co., Inc	69
Industrial Machinery Co	70
Iroquois Machy. Co	69
Jones Machine Tool Co	71
Lucas & Son, Inc., J. L	69
Marr-Galbreath Machinery Co	68
Miles Machinery Co	68
Morey Machinery Co., Inc	70
Motor Repair & Mfg. Co	70
O'Brien Machy. Co	68
Osborne & Sexton Machinery Co	70
Ott Machinery Sales, Inc	70
Reliance Machinery Sales Co	70
Simmons Machine Tool Corp	71
Strong, Carlisle & Hammond Co	69
Sun Machinery Co., Inc	69
Surplus Material & Machinery Co	71
West Penn Machinery Co	68